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INTRODUCTION

ORIGINALLY THE INTENTION of the author was to confine his studies of the geometrid genus *Hydriomena* to the species occurring in the eastern half of the United States and Canada, i.e., in a general sense, to those species indigenous to the territory east of the Mississippi and Red rivers. However, as studies progressed such a restriction was found to be unsatisfactory, as several of the eastern species showed an area of distribution that extended across the entire continent. In consequence it was decided that the only satisfactory solution would be to enlarge the work to cover all the species found on the North American continent, as far south as the northern Mexican border. To do this it was essential to secure the cooperation of various museums and private collectors in order to have available for study as much material as possible in this very involved and complicated genus. Such requests as were made found an immediate and very satisfactory response. From the United States National Museum, thanks to the kind services of Mr. John G. Franclemont at the time in charge of the geometrid section of the Lepidoptera, and Dr. Edward A. Chapin, Curator of Insects of the Smithsonian Institution, the complete series of type specimens of the species described in the Barnes and McDunnough revision of 1917 were lent for study along with considerable other material. The entire North American hydriomenid collection of the American Museum of Natural History was placed at the author's disposal through the offices of Dr. Frederick H. Rindge and the Chairman of the Department of Insects and Spiders. Drs. T. N. Freeman and E. G. Munroe of the Systematic Unit of the Division of Entomology at Ottawa were responsible for securing the loan of the very considerable material contained in the Canadian National Collection. This had been accumulated largely by the author during his term of office as Chief of the above-mentioned unit and contained type material of all the species described by him during this period. Besides this the complete collections of specimens bred by officers of the various entomological laboratories across Canada who were connected with Forest Insect Survey work were included. These were especially valuable

as furnishing data on larval food plants, although the specimens themselves were often dwarfed and aberrant in pattern and coloration, owing to conditions obtaining during breeding. From the far west Mr. Lloyd Martin of the Los Angeles County Museum submitted their entire collection belonging to this genus. The late Mr. John L. Sperry of Riverside, California, with his customary generosity, furnished a large quantity of material collected by his wife and himself on their numerous trips throughout the southwestern states. Since this paper was submitted for publication, the Sperry collection has come by bequest to the American Museum of Natural History as part of its permanent collection. In the following pages, therefore, specimens referred to as being in the Sperry collection are now in the collection of the American Museum of Natural History. That well-known collector, Mr. William Bauer of Petaluma, Sonoma County, California, was also helpful with Californian species and collecting data. Mr. D. S. Fletcher of the British Museum (Natural History) was most cooperative in clearing up certain difficulties in connection with type material of Walker and Zeller contained in that institution. Various other private collectors interested themselves in the project and submitted, from time to time, specimens which they had collected and which required identification; in this way valuable information regarding distribution was obtained. Finally, as regards eastern material the fine series of Nova Scotia species, made in the past few years by Mr. D. C. Ferguson, were naturally available at all times. To all these institutions and gentlemen the author's most sincere thanks are due; the study would have been impossible without their assistance. The author's thanks are further due to Mrs. Rose Ismay, secretary in the Department of Insects and Spiders of the American Museum, for her excellent work in typing the manuscript and checking on bibliographic references; also to Miss Marjorie Statham, of the Illustrators Corps in the same museum, for her care in mounting and grouping the genitalic drawings; finally to Miss Sheila Matthews of the Nova Scotia Museum of Science who arranged the photo-

graphic illustrations of the various species.

Despite this large accumulation of specimens certain problems in connection with the identity and distribution of several western species could not be solved satisfactorily, and the well-known cry of "more material needed" still holds good. In such doubtful cases as much information as possible has been supplied, including genitalic slides of type material, whenever this could be done; the matter must so rest until further collections come to hand.

In the present study considerable stress has been laid on genitalic characters, especially those of the female sex which had heretofore been only partially considered. As a consequence the old classification, based on palpal length, has been abandoned, and the sequence of species follows more or less a system based on similarity of genitalia. In those species with simple male uncus so much divergence has been found in the female genitalia as to prohibit their placement along with the much larger series of species in which the uncus is forked apically. In consequence it has been decided to arrange the species in "groups" rather than resort to the creation of a number of subgenera or even genera; this latter method has been employed in only a single instance. A key to these various groups is given, but it has been found quite impracticable to prepare a workable key that would cover all known species. In consequence copious illustrations of genitalic characters are offered, based, wherever possible, on type material. As a further assistance in determination of material, photographic figures of adults which have as yet not been satisfactorily illustrated are given; this includes the types of all species described by the author while in charge of the Canadian National Collection. Under the various group headings a preliminary discussion of the included species and the value of their genitalic characters is to be found and, under each specific title, a detailed descrip-

tion of, and the variation in, the genitalia in individual specimens. This variation at times is quite considerable and, in the case of closely allied species, requires a very careful study in evaluation of characters. Other structural details are discussed either under the individual group headings or in the detailed account of each species.

In the case of plates 1-3 the location of the individual specimens is given, insofar as they are not in the collection of the author.

KEY TO *Hydriomena* GROUPS, BASED ON GENITALIA

1. Uncus of male apically bifurcate 2
Uncus of male simple 3
2. Clasper of male with two costobasal tubercles Group I
Clasper of male with single costobasal tubercle Group VII
3. Uncus broad apically 4
Uncus not noticeably broadened apically; transtilla processes weak, finger-like 5
4. Transtilla processes large and heavily chitinized Group II
Transtilla processes weak, finger-like Group VI
5. Clasper with single costobasal tubercle; anellus heavily spined Group VIII
Clasper with two costobasal tubercles; anellus weakly spiculate 6
6. Uncus long, strap-like or slightly hooded. Female genitalia with simple ostium and no chitinized genital plate 7
Uncus short, stubby, bent ventrad. Chitinized costal edge of clasper projected far beyond margin of valvula. Female genitalia with well-developed semicircular genital plate Group III
7. Uncus slightly hooded. Bursa of female genitalia with signum Group IX
Uncus strap-like. Bursa without signum 8
8. Aedeagus armed with weak cluster of thin cornuti. Female ductus terminating in a heart-shaped chitinous ring Group IV
Aedeagus armed with strong spines. Female ductus without terminal ring Group V

SYSTEMATIC ACCOUNT OF THE SPECIES OF *HYDRIOMENA*

GROUP I

THIS GROUP must be considered as the typical one of the genus, containing, as it does, the European *coerulata*, the genotype, designated by Hulst in 1896 (Trans. Amer. Ent. Soc., vol. 23, p. 283) under one of its numerous synonyms, *trifasciata* Borkhausen. It contains the larger number of our North American species, comprising all those, with one or two exceptions, in which the uncus of the male genitalia shows a bifurcate apex. On the characters found in the uncus it may be divided roughly into two sections, viz., one containing individuals in which the excavation between the forks of the uncus is very deep and the neck is in consequence very short and often thick, and the other, those with a less deep excavation, short forks, and a longer and generally much thinner neck. While such differences on the whole are useful in a grouping of species, they cannot be depended upon entirely to show relationship. This is notably the case with the species *renunciata* Walker which possesses the deep bifurcation, but on female genitalic characters is very closely allied to a species (*divisaria* Walker) with short uncus forks. In other characters of the male genitalia the species are remarkably homogeneous and present few and often not very stable differential characters.

In figure 1 the right clasper and adjacent parts of the genitalia of *H. divisaria frigidata* are reproduced and may serve as a model of the general type of organ found throughout the numerous species of the group. In the clasper particularly very little individual change can be noted, and such differences as do occur are largely confined to the size of the costobasal tubercles I and II, and the thickness of the chitinous ribbon from the former. In the basal half of the clasper a large hollow space occurs between the dorsal and ventral surfaces. This is open inwardly on the ventral side towards the base, and a similar opening occurs on the dorsal side at the junction of what may be termed the sacculus and the valvula. This latter section is very thinly chitinized and liable to be partially folded; it is covered ventrally with long setae arising from small papillae. The costa is chitinized, thick

at the base, and gradually tapering to, but not projecting beyond, a point near the apex of the valvula. The lateral processes from the transtilla are very uniform in character, being weak, finger-like, and furnished with short scattered apical setae; one exception occurs in *septemberata* where the processes are knob-like. The juxta plate is quite variable in the different species and shows frequently good specific characters. In the contour of its lateral edges it is subject to a certain amount of individual variation, and too much stress should not be laid on this character. A thinly chitinized marginal band edges the plate proper, especially in the basal section, and this at times has specific value. The base itself is either quite thin and definitely stalked or else thicker with little of a stalked nature evident. Apically the plate terminates in lateral projections which vary considerably in prominence. They are usually furnished with weak clusters of long hairs, much longer than the vestiture of the remainder of the plate. The anellus is always finely spiculate. The aedeagus is long and thin and shows little of value specifically, except that in certain species the vesica is furnished with a very weak and obscure cluster of small cornuti.

In the female genitalia, which are regarded as showing better evidence of relationship than the male organ, there are numerous variations. All the species agree, however, in showing a broad, membranous, funnel-shaped ostium, leading into a short, narrow, membranous neck which terminates in a chitinized half collar, open on the dorsal side. The ductus bursae is always well chitinized but variable in shape and length; it is partially divided into two sections by a vertical septum in its median area. The ductus seminalis arises at the proximal end from a small membranous bulb situated on the ventral side of the ductus bursae. The bursa is entirely membranous, oval or globular, and most frequently shows a large, hollow, semicircular, chitinized protuberance on its left proximal surface, attached by a band of chitin to the ductus; this protuberance has been termed a digitabulum. The actual shape of the digitabulum

is of no particular moment and varies greatly in individuals; its position on the bursa, however, is of very great value as a means of specific determination and also as a factor in

species with two digitabula. These may be placed close together and centrally at the distal end of the ductus as in *glaucata* Packard and *crokeri* Swett, or wide apart on the ven-

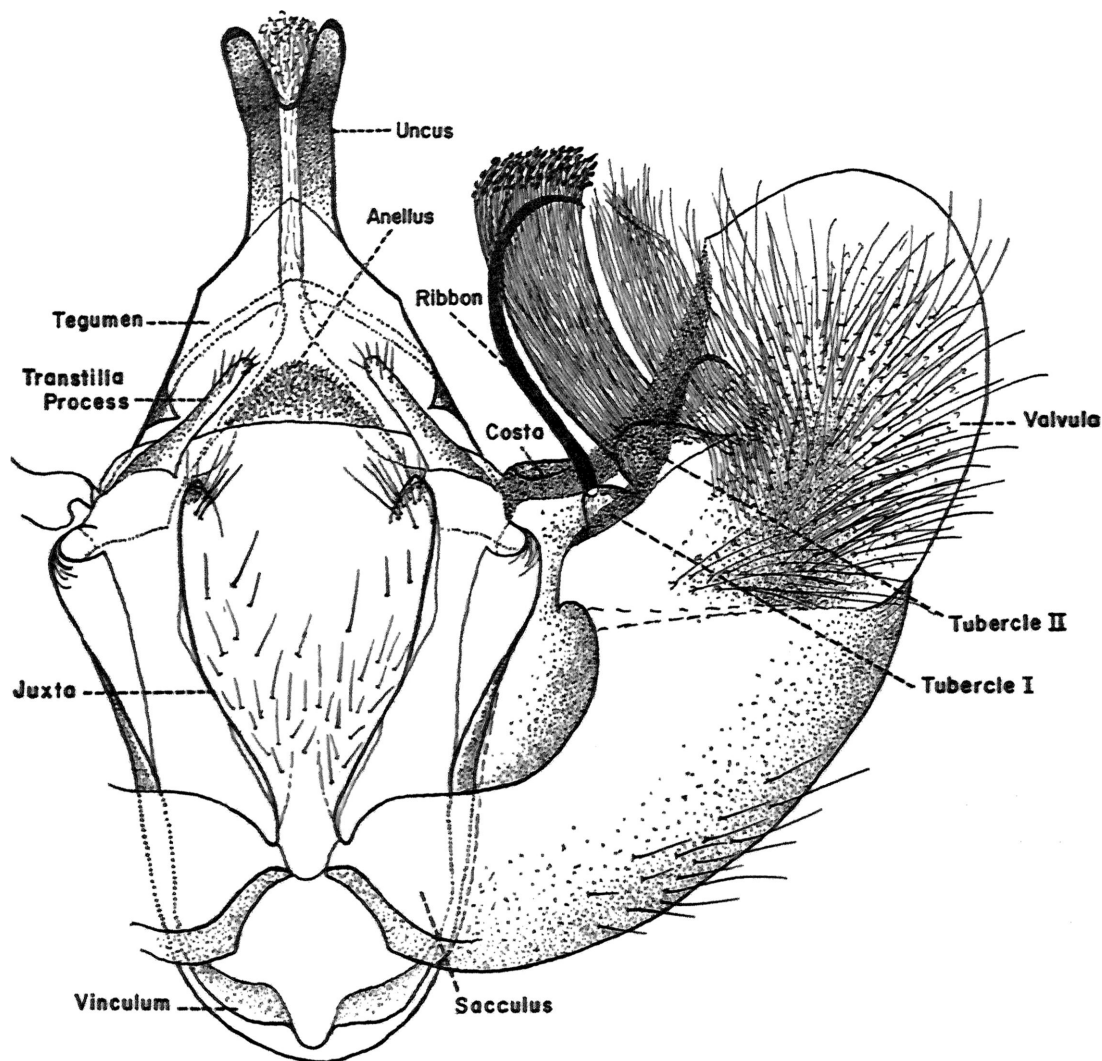


FIG. 1. Male genitalia of *Hydriomena divisaria frigidata* Walker, left clasper removed.

judging relationship. In a few species (*borusata* Barnes and McDunnough and *irata* Swett) it is lacking. In several others, such as *albimontianata* McDunnough, it is placed on the median ventral surface of the bursa. In certain other species (*californiata* Packard and the *nevadae-sierras* complex) it has been transferred to the right side. Finally we find

tromedian and dorsomedian sections of the bursa as in *pluviata* Guenée; the most curious arrangement is found in *transfigurata* Swett and its allies where the two digitabula are much twisted in a chitinous band around the termination of the ductus. The distal end of the chitinized ductus on the right side is frequently somewhat raised, presenting a rather

tubular appearance. At times, in certain specimens, this tubular appearance is exaggerated so that an incipient second digitabulum is formed. Such an occurrence is found most frequently in *renunciata*. As far as can be told this is merely an individual aberration and not an indication of another species or subspecies.

As regards the palpi the group contains species belonging to all three categories of the classification used in 1917, viz., "short," "moderate," and "long." It has been shown on several occasions recently that such a classification is untenable, as it fails to associate species which on other characters, notably genitalia, are obviously related. Nevertheless the length of the palpi is at times of great value in separating species with a very similar type of maculation, although the character must be used with care, because in some cases the female palpi are longer than those of the males of the same species. The position of the palpi in relation to the front should also be considered; palpi closely appressed to the front, the normal position, appear shorter, at first glance, than those which, at the death of the adult, have assumed a more porrect position. As instances of species with extremely short palpi *expurgata* Barnes and McDunnough and *albimontanata* McDunnough may be cited, although these two species have no really close relationship. Species with palpi that project slightly beyond the front but can still be classified as short are *tuolumne* Barnes and McDunnough and *exculcata* Barnes and McDunnough. The remainder of the species, classified in the 1917 revision as possessing "short" palpi, merge gradually into those of the "moderate" palpi group. Unless, therefore, some good reason for a change is indicated, the order of the species has been largely retained as it appeared in that revision. The classic example of a species with long palpi is *ruberata* Freyer; *glaucata* Packard, *modestata* Barnes and McDunnough, and *edenata* Swett, at least as far as the females are concerned, would also fall into this category but are not actually closely related.

In type of maculation all the species in the group are very similar. The primaries are crossed by five lines or bands as follows: A subbasal, oblique, black line, termed line I, which has considerable classificatory value

according to its rigidity or sinuosity; a waved blue-black band, band II, which runs through the central section of what is usually a broad, dark, antemedian area and may at times be much obscured; its termination is frequently marked by a dark dash along the inner margin; lines III and IV are dark, thin, and often obscure; they form the inner and outer boundaries of a more or less pale postmedian area; line III is somewhat wavy as a rule and more or less parallel to line I; line IV characteristically is angled inward on the cell, followed by a more or less prominent excuvation, after which it slopes inward, narrowing, in consequence, the pale area considerably at the inner margin; band V separates the subterminal and terminal areas of the wing and is similar in color to band II; it varies in breadth and contour and, while fairly stable in character in individual species, is not altogether reliable by itself as a means of specific separation.

The coloration of the species in the group is extremely variable and forms one of the main obstacles in the work of classification. Apparently it is considerably influenced by factors of temperature and humidity, especially in such large areas as the state of California where all manner of conditions exist from high temperatures and great aridity in the south to the direct opposite as found in the higher Sierras or the northern coastal counties. For this reason it has been impossible in certain instances to evaluate correctly the specific validity where material has been scanty, or even to decide as to whether one is dealing with mere forms or good subspecies. In such cases every effort has been made to illustrate characters taken from the original types or topotypical material and to explain, even at the risk of being considered too prolix, the difficulties involved. Much intensive collecting and, above all, study of life histories will be necessary before a thoroughly sound view of the species and subspecies of this large group can be presented.

***Hydriomena tuolumne* Barnes
and McDunnough**

Text figures 2, 3, 123

Hydriomena tuolumne BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 13, pl. 2, figs. 13, 14, pl. 8, fig. 2 (male genitalia).

The species appears to be rare as, apart from the type series, only a few typical specimens have been available for study. The types were secured at the Tuolumne Meadows, Tuolumne County, California, by G. Pilate, at an altitude of 6000 feet and are dated August 8-15. The type male is herewith designated as lectoholotype, and a figure of the salient portions of its genitalia is given. Characteristic of the species are the short palpi, the rather delicate maculation of the primaries, with considerable ruddy suffusion in the paler areas, with a distinct dark line of scaling along the inner margin terminating the antemedian band, this being well reproduced in the original illustrations. The male antennae are thin and show scarcely any traces of serrations on their ventral edges. The scaling of the front is largely whitish. A specimen of the type series is mentioned as occurring in "So. Fork, San Bernardino Mts., Calif. (Grinnell)," 6200 feet, June 24, 1907, a locality which may be on the Santa Ana River; this male was figured (*op. cit.*, pl. 2, fig. 13). A single typical male from the Los Angeles County Museum was collected at Camp High Sierra, Mammoth Lakes, Mono County, on July 19, 1944, and a female in the Sperry collection is from Mono Lake, Mono County, July 27, 1933 (M. L. Walton). There is also a female in the Canadian National Collection from Virginia Lakes, Mono County, elevation 8201 feet. The original description mentions a female from the Lake Tahoe region. The above are the only California records known to the author; as far as can be judged, the species is confined to higher altitudes in the Sierras.

MALE GENITALIA: (Based on the holotype). Uncus neck long and thin; forks short, with somewhat downcurved and pointed apices; excavation between them V-shaped; no lateral swellings at base of neck. Tegumen broadening rapidly, without shoulder; inward projections near base narrowly triangular, pointed. Finger-like processes from transtilla, moderate in size, with the usual apical setae. Clasper short and broad, with only slight median invagination of ventral margin; costobasal tubercle I with strong, recurved, chitinous ribbon; tubercle II, besides the usual cluster of knobbed hairs, shows on the side adjacent to tubercle I a very fine chitinized

hair. Juxta plate high and rather narrow; lateral edges sloping strongly inward to a narrow base and bordered in the basal two-thirds by a broad, thinly chitinized, marginal strip which rather lessens the stalked appearance of the base; space between the rounded termination of the plate and the sacculus edge very narrow. The apical projections are weak and from them arise the usual tufts of long hairs. The setae on the lateral portions of the plate are fine and rather sparsely distributed. Spiculation of the anellus fine. Aedeagus normal, with no armature of the vesica.

FEMALE GENITALIA: (Illustrated from a paratype which was in better condition than the slide of the allotype). Ostium and proximal portion of the neck normal. The chitinized ductus bursae is somewhat irregular in shape and bends slightly to the right; the distal end of the left dorsal side is continued by a weakly chitinized strip which curves to the left and terminates in the large rounded digitabulum which (at least in the paratype slide) is closely approached to the edge of the ductus and occupies the normal position on the left proximal side of the bursa. The distal end of the right ventral side has a somewhat tubular appearance, and the septum partially dividing the ductus is strong and well chitinized. Bursa oval, membranous, the dorsal attachment to the ductus close to its distal end.

TYPES: Holotype, male, allotype, female, and one male, four female paratypes, Tuolumne Meadows, Tuolumne County, California, 6000 feet, August 8-15; one male, paratype, South Fork, San Bernardino Mountains 6200 feet, June 24, 1907 (United States National Museum, *ex* collection Barnes).

DISTRIBUTION: Southern Sierras, extending northward at least as far as Placer County.

REMARKS: A single female from the J. Baker collection, Baker, Oregon, which was taken at Olive Lake in the Kootenay National Forest, British Columbia, has been examined and placed as closest to *tuolumne*. The genitalia do not agree very well with those of the type series, and, until more material is available for study, the identity is doubtful.

Hydriomena exculpata exculpata Barnes
and McDunnough

Text figures 4, 5, 6, 124

Hydriomena exculpata BARNES AND MCDUN-

NOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 14, pl. 3, figs. 1, 2, pl. 8, fig. 3 (male genitalia).

Hydriomena exculpata form *tribulata* BARNES AND MCDUNNOUGH, 1917, *op. cit.*, vol. 4, no. 1, p. 14, pl. 3, fig. 3.

The type material and several other topotypical specimens have been available for study. The figures given of the holotype male and allotype female, as well as of the type female of the form *tribulata*, give an excellent idea of the maculation, and no further comment in this respect is needed. The male antennae are thin, the ventral edge showing little trace of serration. The palpi project well beyond the front but would still be considered short, according to the grouping of the 1917 revision.

In the male genitalia there seems to be considerable variation in the width of the neck of the uncus. The holotype, as herewith illustrated, shows a broader neck than usual, as a comparison with the figure given with the original description (pl. 8, fig. 3) and with the present drawing from a topotypical male will show; other details, however, agree. A more comprehensive description, based on the holotype organ, follows.

MALE GENITALIA: Uncus neck very broad, with slight lateral protuberances at base; narrowed somewhat apically before branching of forks, which are short, rather widely separated by a V-shaped incision, and with their apices bent ventrad and pointed. Tegumen broadening rapidly, without shoulder, and with the distal inward projections narrowly triangular. Transtilla processes long, thick, and well haired. Clasper normal, with the usual slight median invagination of the ventral edge; a strong, chitinized, curved ribbon arises from costobasal tubercle I, and adjacent to this a very fine one from tubercle II, with the usual strong tuft of curved knobbed hairs, is present. Juxta plate long, broad apically, with the usual projections fairly evident and the tuft of long hairs in this region coarser than usual; the lateral edges slope evenly inward to a rather narrow but not noticeably stalked base, the basal two-thirds of the plate being margined by a well-defined, thinly chitinized strip. The vestiture of the plate consists of long, fine, rather sparsely scattered hairs; space between the base of

the plate and the edge of the sacculus is very narrow. Anellus finely spiculate. Aedeagus normal.

FEMALE GENITALIA: Quite normal in structure, with a large digitabulum arising on the left proximal side of the bursa. The chitinized neck of the ductus bursae longer and more upright than in *tuolumne*, the sides being semi-parallel. As in *tuolumne*, the left dorsal side of the ductus is continued by a broad chitinized strip which curves to the left to join the base of the digitabulum; the ventral distal edge of the chitinized area is in consequence strongly upwardly oblique from left to right. The partial septum is deep and well defined, and the distal end of the right section appears tubular. The dorsal attachment of the oval membranous bursa to the ductus occurs in its median section, considerably more proximad than in *tuolumne*.

TYPES: Holotype, male, and allotype, female, Ketchikan, Alaska (United States National Museum). Two male and four female paratypes in the same institution, and single paratypes in the Canadian National Collection. Form *tribulata*, holotype, male, same locality (United States National Museum).

DISTRIBUTION: The nimotypical form is so far known only from the southern tip of Alaska.

***Hydriomena exculpata josepha*, new subspecies**

Plate 1, figures 1, 2; text figures 7, 8

Several very fresh specimens from the Sperry collection, captured in northeastern Oregon, are considered as belonging to a subspecies of *exculpata*. Although the male genitalia differ considerably, the maculation of the primaries is practically identical. The brown shades of the nimotypical form are, however, much reduced and are only found in the male as bands bordering both sides of the pale postmedian area; in the female they are obsolescent. In this respect they approach the form *tribulata*, but the antemedian band is more heavily suffused with smoky shading and appears, therefore, more prominent than in *tribulata*, although not quite so obvious as in the type form. Line I is very heavy, as is also the black streak along the inner margin in the antemedian area. There

is a fine sprinkling of gray over the pale postmedian band, especially in the female. The terminal area in the male is considerably sprinkled with smoky scaling, the paler areas appearing as spots or streaks; these are almost entirely obliterated in the female, owing to a more extended smoky suffusion.

While the genitalia of the female show no noticeable differences from those of the nymotypical form, the organ in the male, as noted above, varies considerably. The most marked difference is found in the uncus neck which is long and thin without any median swelling; the forks, however, are essentially of the same shape, and the basal tubercles are very prominent which at once separates the race from *tuolumne*. The juxta plate is somewhat thinner and appears more stalked at the base. In view of the fact that the female genitalia are similar in both forms, it seems advisable for the present to consider such differences as indicating merely subspecific status.

It is interesting to record that among the Sperry material a single female has been found, taken on the upper Santa Ana River, San Bernardino County, California, on July 10, 1948, which obviously belongs here and approaches even more closely to *tribulata* in maculation than do the Oregon specimens. It has not been included in the type material owing to the wide distance between the localities, but it would appear to indicate that the species has a much greater range of distribution than has heretofore been suspected. Specimens mentioned in the original description of *exculpata* from Kaslo, British Columbia, and Silverton, Colorado, have been examined from material sent from both the Canadian National Collection and the United States National Museum. As far as can be told from the worn and faded condition of the specimens, they appear to be best placed as *exculpata josepha*; a single slide of the male genitalia and several slides of the female organ match the slides of the male holotype and female allotype excellently, with the exception that in the male the forks of the uncus are not so widely separated as in the holotype. The Kaslo specimens came originally from the Cockle collection and the male bears the date June 21, the females being dated a month later; the Silverton females

were taken by the author, July 16-23, while curator of the Barnes collection. Other localities represented by single females are Stickeen, British Columbia, June 12, from a specimen in the United States National Museum, and Mt. Cheam, British Columbia, July 22, and Hall Valley, Colorado, June, from specimens in the Canadian National Collection. On account of their condition it has been considered unwise to make these specimens paratypes.

HOLOTYPE: Male, Chief Joseph Mountain, Joseph, Oregon, June 30, 1950 (G. and J. Sperry) in the American Museum of Natural History.

ALLOTYPE: Female, same data, in author's collection for the present.

PARATYPE: Male, Wallowa Lake, Oregon, July 4, 1949 (G. and J. Sperry), in collection Sperry.

DISTRIBUTION: Apparently occurs throughout the Rocky Mountain area, extending southeastward into the San Bernardino Range.

***Hydriomena exculpata nanata*, new subspecies**

Plate 1, figure 3

This very interesting subspecies of *exculpata* occurs in the Hudsonian zones of eastern North America. It is characterized by its small size, the specimens being scarcely half the size of the nymotypical form. The maculation of the primaries is quite similar; the antemedian band is brown, with a slight ruddy tinge and with a prominent black streak along the inner margin. The postmedian pale band is light grayish white, and the subterminal and terminal areas are somewhat suffused with the same shade as in the antemedian band.

In the genitalia of the male the uncus is very similar to that of *exculpata josepha*, the base of the narrow neck showing strong lateral protuberances. The female genitalia, apart from their somewhat smaller size, are similar to those of the western forms.

HOLOTYPE: Male, Jefferson Notch, New Hampshire, 3000 feet, June 29, 1952 (D. C. Ferguson); to be deposited in the Canadian National Collection.

ALLOTYPE: Female, Bradore Bay, Quebec, July 5, 1930 (W. J. Brown), in the Canadian National Collection.

PARATYPE: Male, Hopedale, Labrador, June 18, 1924 (W. W. Perrett), in the Canadian National Collection.

REMARKS: The widespread divergence between the various localities of the type series might be the subject of some criticism. It is, however, a well-known fact that many species of Lepidoptera occur in the Presidential Range of New Hampshire which otherwise are found only along the north shore of the St. Lawrence River and in Labrador. The three type specimens are so similar in every way that no doubt can exist as to their definite association.

Since the manuscript of this revision was prepared, a male of this race was taken at light at Halfway House, Mt. Washington, New Hampshire, by D. Ferguson on June 28, 1953.

Hydriomena expurgata expurgata

Barnes and McDunnough

Text figures 9, 10, 125

Hydriomena henshawi expurgata BARNES AND MCDUNNOUGH, 1918, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 2, p. 139, pl. 21, fig. 6 (female, not male as stated).

Hydriomena expurgata, MCDUNNOUGH, 1945, Canadian Ent., vol. 77, p. 65; 1952, Amer. Mus. Novitates, no. 1952, p. 8, figs. 14, 18, 23.

The necessity for the raising of *expurgata* to specific rank has already been explained (1945); the designation as holotype of the female figured with the original description was made in the author's recent article (1952). Very characteristic for the species, apart from its genitalia, are the extremely short palpi which barely exceed the front; this character is shared by only one other species, viz., *albimontanata*. The figure of the holotype is excellent, and this, combined with the information contained in the original description, should render identification fairly easy. The pale, rather delicately and contrastingly marked, nymotypical form with its ruddy suffusion bordering the pale postmedian band is apparently quite restricted in its distribution. Apart from the type material from Monachee Meadows, Tulare County, California, only a single male specimen from the Los Angeles County Museum has been examined which at all approaches

these types in maculation. This specimen was taken at Bishop Creek, Inyo County, on June 9, 1935, a locality also on the eastern slopes of the Sierras. The duller gray form in which the contrasting maculation is much obscured by considerable fine smoky sprinkling in the basal and postmedian areas has recently been given the racial name *franclemonti*; in the Rocky Mountain regions the species occurs in slightly modified forms which are dealt with below. The genitalia of the types have already been figured (1952), but these are again included for the sake of comparison. A more detailed description is herewith appended.

MALE GENITALIA: Uncus neck long, moderately broad, with lateral swellings at the base; forks broad, rather short, somewhat excurved, with rounded apices, the excavation between them rather narrow and V-shaped. Tegumen narrow, with slight trace of a shoulder apically; basal inward chitinous projections large, triangular. Transtilla with thin, rather long, finger-like processes with very fine apical hairs. Clasper with well-defined median emargination of ventral edge; costobasal tubercles rather small; tubercle I gives rise to a broad, sickle-shaped chitinous ribbon, rather shorter than usual and pointed apically. Tubercle II with the usual tuft of recurved finely knobbed hairs; in addition, on the side adjacent to tubercle I, a distinct, thin, chitinized hair arises, slightly expanded at apex; occasionally even two such hairs may be observed. Juxta plate rather narrowly upright, the sides being almost perpendicular except for an incurve at base where the outline of the edges is quite improminent; the base in consequence presents a rounded appearance rather than a stalked one. There is a definite, thinly chitinized, marginal band edging the basal half of the plate and narrowing towards apex; the apical projections are very weak and show only traces of the long hairs usually found in this area; the lateral areas of plate with very fine, short setae. Anellus strongly spiculate. Aedeagus long, thin, the vesica with faint traces of a patch of small scattered cornuti.

FEMALE GENITALIA: Quite normal in type. The chitinized ductus bursae is moderately long, the sides in general parallel but with a tendency for the right side to bulge outward

distally; the distal edge of the ductus gives rise to a strong digitabulum on the left side and is continued across the membranous bursa almost transversely, with little of the upwardly oblique nature found in several other species. The dorsal attachment of the bursa to the ductus occurs virtually in its median section. The septum appears quite weak.

TYPES: Holotype, female, and allotype, male, Monachee Meadows, Tulare County, California, July 8-14 (United States National Museum, *ex* Barnes collection). Paratypes, same locality (United States National Museum); one female (Canadian National Collection).

DISTRIBUTION: As far as is known at present, the nimotypical form is restricted to the east side of the Sierras in Tulare and Inyo counties, California.

Hydriomena expurgata franclemonti
McDunnough

Hydriomena henshawi BARNES AND McDUNNOUGH (*nec* Swett), 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 15, pl. 2, fig. 9.

Hydriomena expurgata franclemonti McDUNNOUGH, 1952, Amer. Mus. Novitates, no. 1592, p. 8.

Apart from the localities mentioned in the original description, a female from Bishop Creek, Inyo County, elevation 9200 feet, July 18, 1941, a very worn male from Bartle, Siskiyou County, and another male from Lake Tahoe, Placer County, have been found in the Sperry collection. This last specimen shows on the primaries considerable brownish shading bordering the pale postmedian band, approaching in this respect the nimotypical form; slighter indication of this shading is found in two females of the type series. A single female in the J. Baker collection from Spring Creek, Baker, Oregon, has also been examined and placed under this name. All these specimens show the more extended gray suffusion of the basal and postmedian areas characteristic of the subspecies. No appreciable differences in genitalia have been found between the two races.

TYPES: Holotype, male, Deer Park, Placer County, California, June 18, 1908, elevation 6500 feet (United States National Museum).

Allotype, female, Quaking Aspen, Tulare County, California, June 20, 1936 (L. Martin), in author's collection for the present. Paratypes, three males, five females, in the Canadian National Collection, Los Angeles County Museum, and author's collection.

DISTRIBUTION: From the material examined it would appear that the race is the dominant one in the Sierras, extending from Siskiyou County to Tulare County. The most northerly record at present known is that from Baker, Oregon.

***Hydriomena expurgata nicolensis*,**
new subspecies

Plate 1, figure 4; text figures 11, 12

A small series in the Canadian National Collection collected at Nicola, British Columbia, appears to represent a slightly modified race from the northern Rocky Mountain areas. It resembles quite closely the California *franclemonti* but is considerably browner in the general appearance of the primaries, the maculation, apart from the subbasal line, being rather obscure. From the data on the specimens this race would appear to occur a month earlier than that of the Sierras in spite of its more northerly habitat. The male genitalia, as far as can be told from the limited material, lack almost completely the lateral swellings at the base of the uncus neck, and the apical projections of the juxta plate are considerably more prominent; there is also more of a shoulder in the apical portion of the tegumen. In the holotype male clasper the costobasal tubercle II gives rise to a chitinous ribbon almost as broad as that from tubercle I, its base forming practically an intermediate tubercle between the two normal tubercles; besides this there is a much finer, chitinized hair from the adjacent side of tubercle II. This is apparently an abnormality as it is not found in a slide of one of the paratypes.

HOLOTYPE: Male, Nicola, British Columbia, May 14, 1923 (E. R. Buckell), in the Canadian National Collection.

PARATYPES: Four males, same data, in the Canadian National Collection, the American Museum of Natural History, and author's collection.

REMARKS: A single male in the Canadian National Collection, taken at Nicola, May 24, 1932, by P. N. Vroom, shows a broad,

paler, median area and approaches in general appearance the typical form.

Hydriomena expurgata alticola, new subspecies

Plate 1, figure 5; text figure 126

A striking series of specimens which appear to represent a high-altitude race of the Colorado Rockies has been received for study. These consist of a male and two females from the Canadian National Collection collected by Dr. Roy Wiest in Estes Park, no further data given, and originally in the Sperry collection. A longer series of eight males and six females has been sent very recently for identification by R. H. Leuschner who collected them in two localities in Rocky Mountain National Park, viz., Glacier Basin Camp at an altitude of 8500 feet and Big Thompson Canyon at a lower altitude of 6200 feet, in early June. According to Sperry the localities are practically identical with that of the Estes Park specimens. Characteristic of this race is the extremely dark coloration of the antemedian and postmedian areas of the primaries which verges on a deep blackish brown; in contrast to this the basal area and the narrow median band stand out quite sharply with their pale coloration bordered by light brown shades. The secondaries are deep smoky, with a discal spot and curved postmedian band showing through from the under side. As is usual in all *Hydriomena* species, there is considerable variation and some of the specimens, notably females from the Big Thompson Canyon, exhibit a greater or lesser degree of smoky suffusion over the pale areas. Such specimens have not been included in the type series nor is a "form" name proposed, as the general opinion at the present time is against such a procedure.

The male genitalia show only a slight variation from those of *nicolensis*. The uncus neck has the same thickness, the excavation between the forks being, however, shorter; the lateral swellings at the base of the neck are better defined; the juxta plate is similar. In the female genitalia the chitinized ductus bursae appears considerably longer and slightly thinner than that of Sierran specimens.

HOLOTYPE: Male, Estes Park, Colorado (Wiest), in the Canadian National Collection.

ALLOTYPE: Female, same data, in the Canadian National Collection.

PARATYPES: One female, same data, in Sperry collection; three males, Rocky Mountain National Park, Glacier Basin Camp, 8500 feet, June 6, 1952 (R. H. Leuschner); one male, two females, Rocky Mountain National Park, Big Thompson Canyon, 6200 feet, June 5, 1952 (R. H. Leuschner). These paratypes are to be distributed later to various museums but remain for the present in the author's collection.

The status and relationships of the three following names are apparently, at the present time, extremely vague and doubtful. They are given specific rank in this paper, but it should be definitely understood that this is a mere temporary subterfuge, due largely to dislike on the author's part to the sinking of any of them as synonyms without adequate reason. The difficulty of correct determination can be attributed partly to the lack of topotypical material of both sexes, partly, in the case of one name, to the poor condition and obscure locality data of the unique type, and further to the fact that all three belong to a California group with palpi of very similar length which places them in the "short" palpi group of the 1917 revision. They all possess a predominantly gray coloration of the primaries and very similar maculation.

Of the three names in question, viz., *henshawii* Smith, *shasta* Barnes and McDunnough, and *borussata* Barnes and McDunnough, described as a race of *shasta*, it may be stated that only the last-mentioned name has been accurately placed, from the genitalic characters found in both sexes. The unique female type of *henshawii* is considerably worn and very unfortunately lacks an abdomen which precludes recourse to genitalic characters. In the original description the type locality is vaguely stated as "Nevada" and the sex wrongly given as a male, an error corrected later by the author (1915, Canadian Ent., vol. 47, p. 63). Dr. F. H. Rindge, who has very recently examined this type, states that the label reads "S. Nevada" which further complicates matters, as this could either be interpreted as "southern Nevada" or "Sierra Nevada." He was further unable to match definitely with the type any of the specimens sent him for this purpose. In the 1917 revision the species was misidentified, as already noted (McDunnough, 1945,

Canadian Ent., vol. 77, p. 65). The name *shasta* was based on a unique male specimen, captured in 1916 by the author at approximately timber line on the western side of Mt. Shasta, the location being reached by a well-marked trail from Sisson. Specimens collected at a somewhat lower altitude along an old wagon road on the east side of Mt. Shasta by various collectors, and at one time doubtfully identified by the author as *shasta*, do not agree well with this unique type in either size or genitalia and are better placed under *borussata*. In all the material examined nothing has been found that could be at all definitely placed under this name, and therefore until some enthusiastic collector braves the 7-mile climb to the type locality and secures further material, the male type must be considered as the only known specimen to bear the name correctly.

Hydriomena shasta Barnes and McDunnough

Text figures 13, 14

Hydriomena shasta BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 15, pl. 3, fig. 4 (holotype); 1918, *op. cit.*, vol. 4, no. 2, p. 139.

An explanation has already been made as to the present necessity of limiting the name to the unique holotype. A recent examination of this specimen shows that the figure given with the original description is good, and attention is called to the small size, suffused maculation of the forewing, the angular nature of the subbasal dark line (line I) below costa, and the narrowness of the paler median band. It should be mentioned that the pale area on the left primary is due to abrasion. Judging by the single palpus remaining on the type, the palpi are slightly upturned and exceed the front by about its width; they are strongly tufted on the second joint with deep smoky brown hairs, both dorsally and ventrally; the third joint is short and smoothly clothed. The male antennae are quite thick for the size of the specimen and laterally compressed as usual, the ventral edge presenting a faintly serrate appearance, because of a slight separation of the segments. Dorsally the terminal margin of each segment is clothed with whitish scales, which project slightly over the distal edge.

The male genitalia, based on a slide of the type, while in general quite similar to those of *borussata*, are in their entirety much smaller, the uncus neck is shorter, and the juxta plate presents more of a stalked appearance at the base; the thin, chitinous, lateral border found in *borussata* is lacking. The value of such characters from a specific standpoint is problematic, but they seem sufficient, in the light of our present knowledge, to render a synonymization of the two names unwise.

MALE GENITALIA: Uncus terminally bifid, the neck rather thin and about equal in length to the depth of the U-shaped excavation between the forks; these are rather thin, not widely separated, with their apices bent slightly ventrad and somewhat pointed. The tegumen shows a slight trace of a shoulder distally, and its chitinous inward projections near base are thin and pointed. The lateral finger-like processes from the transtilla are thin, rather long, and with the usual scattered apical setae. Clasper normal, with very little excavation at the middle of the ventral margin; costal tubercle I gives rise to a rather broad, flat, chitinized ribbon, strongly recurved and pointed; from tubercle II arises the usual cluster of knobbed setae, and on the side immediately adjacent to tubercle I a finely chitinized ribbon can be observed, about one-third of the width of that from tubercle I. Juxta plate with weak, apical projections, broad at its apex, narrowing to about one-third of this width at base which presents a stalked appearance; lateral edges well defined, slightly convex for their apical two-thirds, then incurved to base; very little evidence of thin chitinous edging. The usual tuft of long hairs arises from each of the apical projections and the remainder of the plate, except in the median section, is sparsely covered with fine setae. Anellus very finely spiculate. Aedeagus normal.

FEMALE GENITALIA: Unknown.

TYPE: Holotype, male, Mt. Shasta, California, July 17 (United States National Museum).

Hydriomena borussata Barnes
and McDunnough, new status

Plate 1, figures 6-10; text figures 15, 16, 127, 128

Hydriomena shasta borussata BARNES AND MCDUNNOUGH, 1918, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 2, p. 139, pl. 21, fig. 5 (female, not male as stated).

Hydriomena shasta brunneata BARNES AND MCDUNNOUGH, 1918, *op. cit.*, vol. 4, no. 2, p. 200 (*lapsus calami*).

This name was based on a pair of specimens taken at the Monachee Meadows, Tulare County, California, in July by G. Pilate, a collector who supplied the Barnes collection with a great many California specimens. It was, at the time of description, considered to be a race of *shasta* but, owing to certain discrepancies from this species which cannot now be fully evaluated, it has been tentatively given specific status. As the description was based largely on the female specimen, it seems logical to denote this as the lectoholotype. This specimen was well figured on plate 21, figure 5, but, owing to an unfortunate *lapsus calami*, is listed in the explanation of the plate figures as *H. s. brunneata*, and by a further typographical error as a male instead of a female. This type is evidently slightly aberrant, the usual cross banding in the median area of the forewing being less distinct than usual; it has been impossible to match it exactly in maculation with other material received from various sources for study. However, the genitalia are quite distinctive, and a female specimen from Quaking Aspen, Tulare County, June 20, 1936 (Lloyd Martin), in the author's collection shows exactly the same type of organ. In the forewing maculation of this specimen lines I and IV are a very good match for the same lines in the type, but the antemedian area is more normally marked, band II being broad and well defined and line III, although very fine, quite traceable; band V (subterminal) is also broader and more distinct, and the whole maculation approaches closely to that of the male allotype, as far as can be seen in this rather worn specimen. A male from the same locality as the above-mentioned female is in the Canadian National Collection and matches the allotype excellently in both maculation and genitalia. These two specimens are the only topotypical ones examined and undoubtedly represent *borussata*.

In the male allotype the following structural characters have been noted. The palpi are short, projecting beyond the front slightly more than in *shasta*, the second joint appearing distinctly longer and seemingly less tufted, although this condition may be due to the generally worn condition of the specimen; the third joint is smoothly scaled, with a white tip. The antennae appear to be slightly thicker than in *shasta*, with the serrate nature of the ventral edge practically similar; the white dorsal terminal scales on each segment are much as in *shasta* but project less noticeably.

As compared with the organ in *shasta*, the genitalia show a considerably longer uncus neck, the sides merging gradually, in an even outcurve, into the tegumen; the forks are thicker and wider apart, but their apices curve inward and show the same downward-pointed character as in *shasta*. The tegumen shows a slight shoulder lacking in *shasta*. In the juxta plate the lateral edges are less convex and slope evenly inward towards the base, their contour becoming quite obscure in the basal region; for this reason the section appears less stalked than that of *shasta*. There is further in the basal half a distinct, thinly chitinated band bordering each lateral edge of the plate proper.

It has already been noted that specimens collected on the east side of Mt. Shasta and formerly determined as *shasta* are now placed as *borussata*. Six males and one female, taken by Grace and John Sperry at "Wagon Camp, Mt. Shasta," June 12, 1939, and now distributed in various collections, have been available for study. None of the male specimens are in perfect condition but, apart from a rather darker coloration, match the allotype and the Quaking Aspen specimens very closely in maculation. In some of these specimens the doubly angulate nature of the oblique line I, as typified in the figure of the holotype (*op. cit.*, pl. 21, fig. 5), is quite evident; in others there is a tendency for the angle below the cubital vein to be more or less eliminated, the line being merely concave from the subcostal angle to inner margin. In the genitalia of these males the neck of the uncus tends to be shorter than in the allotype, and there is the usual variation in the depth of the excavation between the

forks; the tegumen lacks the slight shoulder present in the allotype and the Quaking Aspen specimen; the juxta plate, however, is very similar, and the variation mentioned is no greater than that found in most species of *Hydriomena* from different localities. The genitalia of the single female are not quite typical and are discussed in the following paragraph.

Besides the above series, a few specimens taken by W. Bauer July 6, 1941, in the same general region and including several females have been examined. The males are quite normal in maculation and genitalia as is also one female. A second female, while agreeing perfectly genitally, is quite aberrant in maculation, the dark lines and bands, especially line I, being obsolescent and the white bordering of these lines, generally quite inconspicuous, forming the most prominent feature of the maculation. (See pl. 1, fig. 8.) In another female, normal in maculation, the genitalia show an incipient digitabulum on the left side immediately adjacent to the distal end of the septum. This is present in the Sperry female mentioned above, now in the Canadian National Collection, and to a lesser degree in a third female from the Bauer series; it also occurs in a very worn female in the American Museum of Natural History from Medicine Lake, Siskiyou County. It was at first thought that the character might have specific value, but after further consideration it has been decided to regard it as an individual aberration, as such variations have been found to occur occasionally in other species. The specimen with the most evident second digitabulum is figured (pl. 1, fig. 9), and there is nothing in the maculation to indicate specific distinctness.

Finally a series of one male and five females, all rather worn, taken in the Greenhorn Mountains, Kern County, by J. Comstock, Lloyd Martin, and M. L. Walton, and now in the Los Angeles County Museum and the Canadian National Collection, have been available for study. Of these, the male collected June 9, 1938 (Martin), and two of the females, July 3, 1932 (Comstock), are typical *borussata* according to genitalia; another female, July 5, 1932 (Walton), is without abdomen but must without much doubt fall here; in a fourth female, July 3, 1932,

while the maculation agrees with that of the other female taken on the same date, the genitalia are less typical, the proximal portion of the chitinized ductus bulging outward on the right side; in the fifth female, July 5, 1933, the genitalic variation is still more evident, there being a strong bulge on the right side of the ductus at the distal end and the whole ductus presenting a rather twisted appearance. It is presumed that these differences are individual rather than specific.

MALE GENITALIA: Very similar to those of *shasta*. The neck of the uncus is somewhat thicker, the forks are also broader and with their apices distinctly wider apart, the distal ends pointed and bent inward as in *shasta*. The tegumen shows a fairly well-defined shoulder. Finger-like processes from transtilla much as in *shasta*. Clasper similar to that of *shasta* in general appearance; costobasal tubercle I giving rise to a strong chitinous ribbon, sickle shaped and with pointed hooked apex; there appears to be no thin chitinized hair from tubercle II, adjacent to tubercle I, but this may vary in individuals. Juxta plate high and narrow, the sides evenly inwardly oblique to a base which shows less of the stalked appearance of *shasta*; a broad, thinly chitinized band borders the lateral edges in their basal half; apical projections weak, with the long hair tufts inconspicuous; remainder of plate, except central section, sparsely covered with thin setae. Anellus finely spiculate. Aedeagus normal.

FEMALE GENITALIA: Ostium normal, membranous. Neck short, with the usual terminal collar. Ductus bursae long, upright, well chitinized, the sides normally practically parallel, showing, however, in individual variations, bulges either proximally or distally on the right side; inner septum weak except distally where it terminates in a broad blunt spine. On both sides of this spine the distal ends of the two halves of the ductus bulge upward, presenting a distinct tubular appearance; this may, on the left side, be enlarged to an incipient digitabulum in what appear to be individual variants. The membranous, almost globular bursa is attached to the distal end of the ductus; it is without digitabulum.

TYPES: Holotype, female, and allotype, male, Monachee Meadows, Tulare County, California, July (United States National

Museum, *ex* collection Barnes).

DISTRIBUTION: As far as is known, the species occurs in higher altitudes of the Sierras from Siskiyou County to Tulare and Kern counties in the south.

***Hydriomena henshawi* Swett**

Hydriomena henshawi SWETT, 1912, Canadian Ent., vol. 44, p. 164; 1915, *ibid.*, vol. 47, p. 63. BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 15, pl. 6, fig. 12 (*partim*, *nec* pl. 2, fig. 9). MCDUNNOUGH, 1945, Canadian Ent., vol. 77, p. 65.

It has been impossible to identify this species definitely at the present time, and it is very doubtful if it can ever be satisfactorily placed. This is largely due to the poor condition of the unique female type (not a male as stated in the original description), which is worn and lacks an abdomen. As already noted in the preliminary discussion, the vagueness of the type locality adds also to the difficulty of identification. After a careful examination of the type in 1944 the author was unable to match it with any specimens in the Canadian National Collection, although he recognized that the determination in the 1917 revision was erroneous. The same difficulty was encountered by F. H. Rindge in a recent visit to the Museum of Comparative Zoölogy, Harvard College. He very kindly compared four female specimens sent him by the author with the type but was unable to match any one of them with absolute certainty. He states that a specimen from the Greenhorn Mountains, figured as *borussata* (pl. 1, fig. 10), comes closest in maculation. If this be correct, it would appear that the name *henshawi* would take precedence over *borussata*. On the other hand, consideration must be given to the race *quaesitata* of *irata* which occurs in the same general region and is practically identical with *borussata* in color and maculation of the primaries. Under such circumstances the author prefers to leave the matter in abeyance for the present.

TYPE: Holotype, female, "S. Nevada" (Museum of Comparative Zoölogy).

***Hydriomena irata irata* Swett**

Text figures 17, 18, 129

Hydriomena irata SWETT, 1910, Canadian Ent., vol. 42, p. 280; 1911, *ibid.*, vol. 43, p. 81. BARNES

AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 16, pl. 2, figs. 12, 15, pl. 8, fig. 4 (male genitalia).

Hydriomena californiata ab. *niveifascia* SWETT, 1916, Canadian Ent., vol. 48, p. 249. BLACKMORE, 1916, Ann. Rept. British Columbia Prov. Mus., pl. 8 (allotype).

Hydriomena irata ab. *niveifascia*, BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 16, pl. 4, fig. 6 (holotype).

Hydriomena irata form *niveifasciata* SWETT, 1918, Canadian Ent., vol. 50, p. 294.

The type series was based on material from southern Vancouver Island, British Columbia, and topotypical specimens are well figured in the 1917 revision. Apart from a small series in the Canadian National Collection very few specimens from this region have been available for study. The most characteristic and normally constant feature of the maculation of the primaries is the strong obtuse angle of the black subbasal line (line I) below costa. This at once separates the species from *marinata exasperata* and *californiata*, both of which occur in the same region, although the latter species may be further recognized by its longer palpi and its later time of flight, *irata* being an early spring species and on the wing in April and May. Unfortunately in a series of bred material from areas more or less topotypical, received from the Forest Insect Survey, specimens occurred which showed little of this sharp angle of line I, although in other respects normal; this change may be due to altered conditions in breeding.

In coloration there is considerable ruddy suffusion over the primaries; this at times covers the whole antemedian band between lines I and III and is especially noticeable in the female sex; the subterminal and terminal areas also show the same type of coloration. In some males the ruddy color is confined to narrow bands on the inner and outer sides of the pale postmedian band, and in such cases the basal portion of the antemedian band shows the same pale creamy coloration found in the extreme basal space.

With regard to the length of the palpi, the species has been placed in the "short" palpi group by both Swett and Barnes and McDunnough, but this character must be used

with care as there appears to be considerable variation in the apparent length, owing partly to the position assumed in a dried condition and partly to the fact that a marked tendency is shown for the palpi of the female to be slightly longer than those of the male. A separation from *marinata* on this character alone cannot be considered as satisfactory. The male antennae are moderately thick and show on their ventral edge a distinct, though feeble, serration, as mentioned in the original description.

The genitalia in both sexes show considerable relationship to those of *borussata*. In the males the uncus neck is on the whole somewhat broader and shorter than in *borussata*, but this width is inclined to be variable in topotypical material; the tegumen sides slope rapidly outward and show no sign of a shoulder. In the female sex there is no digitabulum or terminal spine to the septum, and the length of the ductus bursae is much shorter, at times being even shorter and broader than in the figure given (fig. 129).

The species is known to extend southward along the coastal area as far as Mendocino, Napa, and Sonoma counties of California. The few specimens examined from this region show little variation from topotypical specimens, the coloration being merely somewhat darker. There is, however, a single odd male in the Canadian National Collection from Spring Mountain, Napa County, which on genitalia cannot be separated from other California specimens but in which the subbasal line shows none of the characteristic angulation, being almost rigidly oblique; the coloration is very dark and the pale postmedian band much reduced in width. From a single specimen no conclusions as to its status can be drawn. In the male genitalia of these California specimens the uncus neck is somewhat thicker than in Vancouver Island species, being on the whole quite similar in this respect to that of the subspecies *quaesitata*.

MALE GENITALIA: (Based on a specimen from Victoria, British Columbia, in the Canadian National Collection). In general quite similar to those of *borussata*. Uncus neck moderately wide and long, somewhat shorter than in *borussata*; forks broad, out-curved, with their apices bent inward and slightly pointed; incision between them

moderately deep and U-shaped. Tegumen without shoulder, the sides sloping rapidly outward from apex to base; inward chitinous projection small, triangular. Transtilla processes fairly long and thin, with the usual apical setae. Clasper rather narrower than usual, with scarcely any invagination of the ventral margin; costa strengthened with the usual chitinous strip; costobasal tubercles present, tubercle I being small, tubercle II much larger and placed obliquely; the usual chitinous, sickle-shaped ribbon from tubercle I and a large tuft of knobbed hairs from tubercle II; adjacent to tubercle I is a very fine chitinized hair. Juxta plate more or less urn shaped, base fairly broad and not noticeably stalked; sides sloping evenly outward and rounded apically to form weak projections which show the usual small clusters of long hairs; thinly chitinized marginal band weak, present only in the basal section; vestiture of plate composed of fine scattered setae; space between base and edge of sacculus moderately broad. Anellus very feebly spiculate. Aedeagus thin, of normal length, without armature.

FEMALE GENITALIA: (Based on a topotypical specimen). Ostium, neck, and half collar normal. Ductus bursae very short, well chitinized, sides slightly expanding distally; partial septum very weak and without the terminal spine of *borussata*. No digitabulum. Bursa small and globular, attached to the distal end of the ductus.

TYPES: Holotype, male, Victoria, British Columbia, April 22, 1909 (Museum of Comparative Zoölogy, *ex* collection Swett); allotype, female, same data, and five paratypes, same locality, April 19–May 3, stated to be in Croker collection, location now unknown. *Niveifascia*, holotype, male, Goldstream, British Columbia, April 19, 1908 (Museum of Comparative Zoölogy, *ex* collection Swett); allotype, female, Victoria, British Columbia, June 6, 1908 (University of British Columbia, Vancouver, *ex* collection Blackmore).

DISTRIBUTION: Pacific coastal area from southern Alaska (Ketchikan) and Queen Charlotte Islands and Vancouver Island, British Columbia, to Mendocino County, California (Anchor Bay, Van Damme State Park), Napa County (Spring Mountain), and Sonoma County (Plantation).

LARVAL FOOD PLANTS: Based on material reared by the Canadian Forest Insect Survey from various localities on the mainland and Vancouver Island, the larvae occurred on Douglas fir (*Pseudotsuga*), hemlock (*Tsuga*), balsam (*Abies*), and spruce (*Picea*).

Hydriomena irata lolata, new subspecies

Plate 3, figure 13

In the southern interior of British Columbia, in the so-called "dry belt," there is a form of *irata* which appears to have attained subspecific rank. The specimens are considerably smaller than those from the Vancouver Island area and in coloration of primaries lack virtually all of the ruddy suffusion of the nimotypical form; there are only traces of this color bordering bands II and V. The general appearance is therefore much grayer than in typical *irata* and leads over to a certain extent to the still duller race, *quaesitata*, from the southern Sierras. The maculation is quite similar and well defined; bands II and V are broad and pale purplish in color; the veins crossing the pale postmedian band above the inner margin are more or less outlined in blackish. A single, much worn male from Kamloops is considerably suffused with smoky and has not been included in the type series. A number of specimens bred by the Canadian Forest Insect Survey from larvae on Douglas fir (*Pseudotsuga*) in localities which, as far as can be determined, are situated in the central section of British Columbia will probably fall under this subspecific category. They are quite dark and show little of the ruddy tinges of the coastal form, but this character may be partly due to abnormal breeding methods which seem to affect the species very easily. Some very dwarfed specimens appear almost black.

HOLOTYPE: Male, Mt. Lolo, Kamloops, British Columbia, May 31, 1938 (G. S. Walley), in the Canadian National Collection.

PARATYPES: Two males, same data as holotype; one male, same locality, June 2 (J. K. Jacob); one male, Kamloops, British Columbia, June 5, 1937 (J. K. Jacob). All these in the Canadian National Collection except one specimen in author's collection.

LARVAL FOOD PLANTS: Douglas fir (*Pseudotsuga*).

REMARKS: It might be well to state that Mt. Lolo is a hill of moderate elevation in the vicinity of Kamloops, much favored as a summer resort by the inhabitants of that city.

Hydriomena irata quaesitata

Barnes and McDunnough

Text figures 19, 20, 130

Hydriomena irata quaesitata BARNES AND MCDUNNOUGH, 1918, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 2, p. 140, pl. 21, fig. 4 (holotype).

Apart from the two male specimens on which the name was based, very few males of this race have been available for study. The color and maculation of the primaries are so similar to those of *borussata* as to make it impossible to identify the race by these characters alone. The genitalia offer the only tangible character for separation, the uncus neck being much shorter and broader than that of *borussata* and agreeing in this respect with specimens of the nimotypical form from Mendocino County in which, as already noted, the neck is broader than that of topotypical *irata* from Vancouver Island. A single male in the author's collection from Quaking Aspen, Tulare County, June 20, 1936 (L. Martin), has been found to agree in genitalia with the holotype. Another specimen in the Bauer collection from Mt. Shasta also appears to fall here by genitalia. The only known female is a specimen found in miscellaneous material received from J. Sperry. This was collected on May 19, 1947, at about 6000 feet altitude on the upper Santa Ana River, San Bernardino County, and shows the same type of characteristic genitalia as those of the nimotypical race. In coloration and maculation it matches the above-mentioned male from Quaking Aspen quite satisfactorily. The genitalia of this specimen are illustrated, as they offer certain minor differences that could possibly be constant.

MALE GENITALIA: Similar to those of the nimotypical form, with the exception that the neck of the uncus is considerably thicker. The juxta plate shows the same inwardly tapering edges to a distinctly stalked base, the thinly chitinated marginal edging being somewhat more prominent. The finger-like processes from the transtilla tend towards a

greater thickness than those of *irata* proper, but this feature is rather variable.

FEMALE GENITALIA: In general characteristics similar to those of *irata irata*, the most striking feature being the entire lack of a digitabulum. The ductus bursae is moderate in length, with more or less parallel sides. The left side, somewhat beyond the median area, curves slightly inward and sends a weak projection dorsad, to which apparently the upper dorsal edge of the bursa is attached. The partial septum is strong and situated slightly to the right of the median area; it forms with the parallel left distal edge of the ductus a species of trough with bulging ventral surface. The right side of the ductus shows a slight, proximal, outward bulge and at its extreme distal end bends shortly inward. The bursa is small, globular, and entirely membranous.

TYPES: Holotype, male, and paratype, male, Monachee Meadows, Tulare County, California, July (United States National Museum *ex* collection Barnes).

DISTRIBUTION: Southern Sierras (Tulare County), possibly extending northward to the Mt. Shasta region; San Bernardino Mountains (upper Santa Ana River).

***Hydriomena perfracta perfracta* Swett**

Text figures 131, 132

Ypsipetes pluvialis GUENÉE, 1857, Histoire naturelle des insectes, vol. 10, p. 378 (*partim*).

Hydriomena autumnalis var. *perfracta* SWETT, 1910, Canadian Ent., vol. 42, p. 279; 1912, *ibid.*, vol. 44, p. 227.

Hydriomena perfracta, BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 18, pl. 4, fig. 1, pl. 6, fig. 13 (holotype). FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem., no. 274, p. 141. McDUNNOUGH, 1951, Amer. Mus. Novitates, no. 1535, p. 8; 1952, *ibid.*, no. 1592, p. 6, figs. 13, 17.

The color and maculation of *perfracta* have been adequately discussed by the author in both the 1917 revision and in a recent number of the American Museum Novitates (1952). In the east there should be no difficulty in recognizing the species as it is the only one of the so-called "moderate" palpi group of large size and strong ruddy suffusion over the pale postmedian band and the

terminal areas of the primaries. On the smoky secondaries the discal spot, postmedian angulated line, and a broader subterminal band stand out very prominently in perfect specimens.

Unlike many species eastern specimens show little variation in either color or maculation, and such condition occurs in material taken across Canada as far as the Alberta foothills. In the genitalia, however, variation, especially in the female organ, is considerable, and the two figures illustrating this and prepared from virtually identically colored females give some idea of the range that may be expected.

In the central Rocky Mountain region of the United States and in the Sierras of California the species is subject to greater variation in size and coloration and breaks up into several apparently good subspecies which have recently been discussed (1952). The subspecies, *exasperata*, however, described from Vancouver Island in the 1917 revision must be transferred to *marinata*.

As regards outer morphological characters, it might be mentioned that the palpi are slightly upturned and project beyond the front slightly more than its width; they are inclined to be longer in the females than in the males. The male antennae are thin, scarcely thicker than those of the female, laterally compressed as usual, and with no indication of serration on the ventral margin. In the Halifax and the Annapolis Valley regions of Nova Scotia the dates of flight range from the last week of May to the middle of June; in Cape Breton Island the flight is somewhat later, from the last week of June into early July.

MALE GENITALIA: (Based on the Baddeck specimen figured by McDunnough, 1952, Amer. Mus. Novitates). Uncus neck short and moderately thick; forks slightly divergent, the excavation between them rather narrow and V-shaped; apices of forks bent inward and slightly pointed. Tegumen rapidly broadening with only a trace of shoulder, the basal inward chitinous projection rather narrowly triangular and quite pointed. Finger-like processes from transtilla normal. Clasper short and broad, ventral margin slightly sinuate; costobasal tubercle I small, giving rise to a thin chitinous ribbon, vari-

ably twisted and less sickle shaped than usual; tubercle II large, broad, and obliquely placed, with the usual tuft of knobbed hairs; no chitinized hair adjacent to tubercle I could be observed. Juxta plate broad apically, with moderately strong projections, the sides sloping inward very sharply to a narrow stalked base; the thinly chitinized, marginal band continuous but broader in basal section; space between base and edge of sacculus quite broad. The usual tufts of long apical hairs are present; the remainder of the plate is sparsely clothed with very fine setae. Anellus strongly spiculate. Aedeagus short and chunky, narrowed slightly proximally.

FEMALE GENITALIA: (Based on specimens from Lequille, Annapolis County, and Baddeck, Cape Breton Island). Ostium and proximal membranous portion of neck normal, with the usual chitinized half collar distally. Ductus bursae well chitinized, normally long, with subparallel sides, the left section considerably longer than the right one and terminating in a large, variably shaped digitabulum, situated on the left proximal side of the membranous bursa. The length of the ductus is quite variable and in a second specimen from Baddeck is much shorter and chunkier, with a strong outward curve on the left side. Distal edge of chitinized ductus upwardly oblique from left to right. Partial septum short, weak, somewhat thickened distally. Dorsal attachment of the membranous oval bursa to ductus normally close to its distal end but more medially placed in shorter and broader ducti.

TYPES: Holotype, male, Catskill Mountains, New York, May 26, 1906 (Museum of Comparative Zoölogy, *ex* collection Swett); paratype, same locality (the American Museum of Natural History, *ex* collection Pearl).

DISTRIBUTION: New York State (Catskill Mountains), extending northward into Nova Scotia (Halifax area, Annapolis Valley, and Cape Breton Island), and westward through Canada to Alberta (Edmonton, Banff, and Calgary regions).

LARVAL FOOD PLANT: Trembling aspen (*Populus tremuloides*), based on two specimens bred at Bannockburn and Heyden, Ontario, by the Canadian Forest Insect Survey.

Hydriomena perfracta marmorata
Barnes and McDunnough

Plate 1, figure 11; text figure 133

Hydriomena marmorata BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 22, pl. 4, fig. 3 (holotype female), pl. 8, fig. 7 (genitalia).

Hydriomena perfracta marmorata, McDUNNOUGH, 1952, Amer. Mus. Novitates, no. 1592, p. 5.

The status of *marmorata* as a subspecies of *perfracta* has already been noted (1952), and further discussion seems hardly necessary. The male genitalia are quite similar to those of eastern *perfracta*; the juxta plate is possibly somewhat narrower, but such variation is often met with in many species. A figure of the genitalia of the holotype is presented and a comparison with the figure of the organ in typical *perfracta* from Lequille will show the close resemblance.

The locality given for the type series is unfortunately very vague, but the suggestion previously made that they may have been collected in the Lake Tahoe region is substantiated by three males recently sent by W. Bauer for identification. Two of these were collected at Mohawk, Plumas County, California, May and June, 1949, and the third came from Johnsville, Plumas County, May 13, 1947. This latter specimen is figured (pl. 1, fig. 11), and attention is called to the narrowness of the pale postmedian band; the antemedian and terminal areas are quite dark, and the amount of reddish suffusion is variable. The only other specimen seen which matches the type series fairly closely is a male from the Los Angeles County Museum taken on May 6, 1937, in Yosemite National Park.

TYPES: Holotype, female, and allotype, male, Sierra Nevadas, California (Edwards), in the American Museum of Natural History. Paratypes in the same collection and in the United States National Museum, *ex* collection Barnes. Male and female paratypes also in the Canadian National Collection.

Hydriomena perfracta centralis McDunnough

Hydriomena perfracta centralis McDUNNOUGH, 1952, Amer. Mus. Novitates, no. 1592, p. 7, fig. 3 (holotype), fig. 22 (genitalia).

This race from the southern Rocky Mountain region is characterized by its large size and reduction of the ruddy suffusion which is also of a lighter coloration. The pale post-medial band is considerably wider and less sharply defined than in *marmorata*. The genitalia of a female paratype, already figured, show the close resemblance of the organ to that of the nymotypical form.

Since the description was published, further material has been examined sent by John Sperry and R. H. Leuschner. This extends the range of *centralis* into Utah and Colorado. In the Sperry collection are a rather small male from Beaver, Utah, July 14, 1937, a faded female from Glenwood Springs, Colorado, June 24-30, evidently originally from the Barnes collection, and a male from Estes Park, Colorado (Wiest). The Leuschner material consisted of two fresh males from Glacier Basin Camp, Rocky Mountain National Park, Colorado, 8500 feet, June 6, 1952, and a worn male and four females from Breckenridge, Summit County, Colorado, 10,000 feet, July 25, 1951. A small series of specimens from the Sperry collection taken in late May and early June over a period of several years on the upper Santa Ana River in the rather isolated San Bernardino Mountains seems best placed as *centralis*. It has been frequently noted that material from this region tends to resemble that from the southern Rocky Mountain areas rather than that from the California Sierras.

TYPES: Holotype, female, Tesuque, New Mexico, June 29, 1932, in the American Museum of Natural History; allotype, male, Turkey Creek Road, White Mountains, Arizona, June 6, 1937 (Andrews and Martin), in the Los Angeles County Museum; paratype, female, same data as holotype, in author's collection.

DISTRIBUTION: Southern Rocky Mountain area (Colorado, Utah, New Mexico, Arizona).

***Hydriomena perfracta monoensis* McDunnough**

Hydriomena perfracta monoensis McDUNNOUGH, 1952, Amer. Mus. Novitates, no. 1592, p. 7, figs. 1, 2 (holotype and paratype).

The most distinctive of the *perfracta* subspecies. As noted in the original description, it is characterized by the greater extent of

the pale areas of the primaries, the light salmon-colored suffusion, and the prominence of the purple-black cross bands II and V. The size is quite variable, ranging in wing expanse from 30 to 40 mm. The time of flight, as far as can be judged, occurs in July and August, much later than that of the other subspecies. There is nothing characteristic in the genitalia whereby the subspecies might be separated from the nymotypical form.

TYPES: Holotype, male, Rock Creek, Mono County, California, 7500 feet, August 19, 1938, Walton, in the American Museum of Natural History; allotype, female, Warren's Creek, near Tioga Pass, Mono County, 9000 feet, July 20, 1941 (C. Henne), in author's collection. Paratypes, as indicated in original description, in the Los Angeles County Museum and in the collections of Sperry, of Rindge, and of the author.

DISTRIBUTION: As known at present the subspecies is restricted to the eastern slopes of the Sierras in Mono, Inyo, and Fresno counties, California.

REMARKS: Since the subspecies was described, three specimens have been received from the Sperry collection taken at Bishop Creek, Inyo County, July 19, 1941, by C. Henne.

***Hydriomena charlestonia*, new species**

Plate 3, figure 15; text figures 21, 22

A single male specimen from the Sperry collection, captured in the Charleston Mountains, Nevada, appears so distinct from any species known to the author that he is risking a description as that of a new species.

The general coloration of the primaries is a light smoky gray, crossed by a broad, dark, oblique, antemedial band; such a light coloration is known only in the Utah species *obliquilinea*, which is totally different genitally, the genitalia of the present species being very similar to those of *marinata*; its exact position and status can only be determined, however, when the female sex is known.

Palpi deep smoky, projecting well beyond front and falling into the "moderate" palpal section of the previous revision. Male antennae thin, laterally compressed, the ventral edge faintly serrate. Front, collar, and pata-gia largely whitish, with a certain amount of

smoky sprinkling; metathoracic tuft black. Primaries light whitish gray, with variable smoky sprinkling. Extreme base of wing with a small dark patch. Pale basal space limited outwardly by line I, which is thick, black, strongly outwardly oblique, with slight outward angles in cell and just above inner margin. The antemedian section appears to form a broad dark oblique area, owing largely to the great breadth of the irregular purple-brown band II which fills nearly the whole space between lines I and III and is quite narrowly bordered on each side by pale areas, considerably sprinkled with smoky; at the extreme costa this band is narrowed to a small dark patch, and it also shows a certain amount of contraction at the inner margin. Line III is well defined, black, somewhat thicker at costa and inner margin; its course is outwardly oblique, more or less parallel to line I, and it shows a faint crenulation. The pale postmedian area is broad and only slightly narrower at inner margin than at costa; its broadest point is at veins 3 and 4 where it bulges moderately outward; it contains a faint, thin, discal streak. Line IV forms the outer boundary of the pale area; it is thick and black, outwardly oblique and faintly irregular from costa to vein 4, then somewhat thinner, forming two moderate rounded bulges crossing veins 3 and 4, then feebly crenulate and nearly upright to inner margin; it is bordered outwardly by an obscure smoky band, only slightly darker than the remainder of the subterminal area. Band V of the usual purplish brown color, oblique and very broad from costa to vein 4, then much narrower and parallel to outer margin to tornus. Terminal area pale, with considerable light smoky sprinkling; the two black transverse dashes below apex rather weak, especially the one crossing band V. Fine black terminal line; veins with short, geminate, black streaks bordering their ends. Fringes light smoky, the basal half darker than the apical one and distinctly checkered with black in the apical half of wing. Secondaries pale smoky, crossed by an angled postmedian line and with faint traces of a subterminal one; beneath paler, with discal dot and postmedian bent line quite distinct, but submarginal shade not visible. Expanse 25 mm. from tip to tip of primaries.

MALE GENITALIA: Uncus with fairly long, broad neck, the moderate forks only slightly bent outward, widely separated by a U-shaped incision, with apices gently bent inward and pointed. Tegumen with merely an indication of shoulder, broadening rapidly towards base, with edges somewhat bent inward and the chitinous projections triangular and pointed. Transtilla processes thin and rather long. Clasper broad at base, the valvula rather small, the ventral edge strongly sinuate; costobasal tubercles normal, the chitinous ribbon from tubercle I broad and twisted, pointed and slightly hooked apically; tubercle II with usual strong tuft of knobbed hairs and apparently a very faintly chitinized hair adjacent to tubercle I. Juxta plate rather broad, with narrow stalked base and convex edges; apical projections weak but with the usual weak tufts of long hairs; thinly chitinized marginal band narrow but continuous; rounded basal projection with small, round, scattered, median lenticles, similar to the hair bases on the main plate; vestiture of plate consisting of scattered thin setae; space between base of plate and sacculus edge quite broad. Anellus weakly spiculate. Aedeagus normal, vesica unarmed.

HOLOTYPE: Male, Sawmill Spring, Charleston Mountains, Nevada, May 12, 1934, in collection Sperry.

REMARKS: The correct position of this species will depend on the type of genitalia in the female, as yet unknown. For the present it is placed preceding *marinata*.

Hydriomena marinata marinata
Barnes and McDunnough

Plate 2, figure 1; text figures 23, 24, 134

Hydriomena marinata BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 19, pl. 6, fig. 6 (holotype).

The name was based on two male specimens. The holotype bears the penciled label "Verdi Nevada, A. H. V." and undoubtedly was received by Barnes from A. H. Vachell, an old collector who probably lived in Verdi, a small town west of Reno on the border of California and Nevada. No specimens from this locality have since been collected, and all the scanty material examined has originated in the northern and central coastal

regions of California as did the paratype which was collected in Marin County by Henry Edwards. An element of doubt exists as to the correctness of the holotype label, but fortunately the slides of the genitalia made from both types agree excellently, so that the question of locality is merely of academic interest. Judging by the data on the few specimens examined, the species is on the wing from mid May to mid June.

Superficially the species appears very similar to *irata* but differs in the lack of a sharp angle to the subbasal line (line I) below costa, this line being more or less evenly oblique, with only traces of an angle in some specimens. The palpi are also slightly longer, and on this character the species was placed in the revision in the "moderate" palpi group. The male antennae are somewhat thicker and show less of the serration of the ventral margin, generally present in *irata*. The male genitalia are also very similar to those of *irata* as far as the structure of the uncus is concerned, but differ decidedly in the shape of the juxta plate which is quite characteristic for the species as a reference to figure 24 will show. The female genitalia of the two species are quite different, those of *marinata* closely resembling the organ in *perfracta*. Most of the material examined came from the Bauer collection, and the unknown female sex was recognized by comparison with males taken in the same localities in both Del Norte and Napa counties. One of these specimens is figured (pl. 2, fig. 1). A pair of specimens (worn) from Russian Gulch, State Park, Mendocino County, June 21, and a large, brightly marked female from Crescent City, Del Norte County, are in the Canadian National Collection.

MALE GENITALIA: (Based on a slide of the holotype). Uncus rather short, with the neck and forks broad, the incision between the latter rather narrow and V-shaped. Tegumen with a mere trace of a shoulder, the basal inward projections long and thin. Transtilla processes normal. Clasper with ventral margin slightly sinuate; costobasal tubercle I short and broad, with broad twisted chitinous ribbon arising from its truncate apex; tubercle II broad, obliquely placed as usual and with the usual tuft of knobbed hairs but without any visible chitinized hair adjacent to tubercle I. Juxta plate quite characteristic,

broad, and chunky with moderately strong apical projections; base broad and not noticeably stalked; the width of the plate is increased by broad marginal bands, rather more heavily chitinized than usual, especially in basal area. The usual long apical hair tufts from the base of the projections are present, the hairs rather finer than usual. Very fine scattered hairs cover all but the central area of the plate; space between base and sacculus margin very narrow. Spiculation of anellus very fine. Aedeagus normal.

FEMALE GENITALIA: (Based on a specimen from Crescent City, Del Norte County, in the Bauer collection). Ostium normal, followed by a short membranous neck terminating in the usual chitinous collar. Chitinized ductus bursae very similar to that of *perfracta*. In the figured specimen the sides are subparallel, with a slight outward bulge on the left side, the chitinization on this side extending considerably farther distad than on the right side and connecting with a large digitabulum placed as usual in the proximal left section of the bursa. The distal margin of the chitinized area very upwardly oblique from left to right. Another specimen from Spring Mountain, Napa County, shows the same variability of the ductus noted and figured in *perfracta*, the bulge on the left side being stronger and the whole ductus somewhat shorter. Partial septum weak. Dorsal connection of the bursa to the ductus slightly proximad of its median area. Bursa oval, membranous.

TYPES: Holotype, male, Verdi, Nevada (United States National Museum, *ex* collection Barnes). Paratype, male, Marin County, California (the American Museum of Natural History).

DISTRIBUTION: Verdi, Nevada, doubtful. Otherwise central to northern coastal areas of California, Marin County; Napa County (Spring Mountain, St. Helena); Mendocino County (Laytonville, Van Damme State Park, Westport); Del Norte County (Crescent City).

Hydriomena marinata exasperata Barnes and McDunnough, new status

Text figures 25, 26

Hydriomena perfracta exasperata BARNES AND McDUNNOUGH, 1917, Contributions to the natu-

ral history of the Lepidoptera of North America, vol. 4, no. 1, p. 19, pl. 4, fig. 2 (holotype), pl. 8, fig. 6 (genitalia). BLACKMORE, 1917, Ann. Rept. British Columbia Prov. Mus., p. 15; 1918, *ibid.*, p. 12, pl. 2.

Exasperata, originally described as a race of *perfracta*, seems better placed as a race of *marinata* from Vancouver Island and adjacent areas. The males are somewhat smaller than those of *irata irata* and somewhat less contrastingly marked, especially in the antemedian and terminal areas where more mixed ruddy and smoky suffusion occurs. The females appear to be considerably larger in size than the males, and two specimens in the American Museum of Natural History from Departure Bay, Vancouver Island, which seem to belong here are as large as the figured specimen of the nymotypical form from Napa County.

In the male genitalia the only obvious difference occurs in the juxta plate which is somewhat higher than that of *marinata* proper and with the lateral margins far less bulging and more evenly inwardly oblique in their basal half; this may be easily noted from a comparison of figures 24 and 26. The female genitalia show no marked differences. The flight of the species is from late June to the middle of July.

TYPES: Holotype, male, Departure Bay, Vancouver Island, British Columbia, July 13 (Taylor); paratype, male, Wellington, Vancouver Island, June 23 (Taylor), in United States National Museum, *ex* collection Barnes.

DISTRIBUTION: Southern Vancouver Island; Olympic Mountains, Washington (Rosemary Inn, Lake Crescent, Sperry).

LARVAL FOOD PLANTS: Douglas fir (*Pseudotsuga*) and spruce (*Picea*) according to records of the Canadian Forest Insect Survey.

REMARKS: A pair of specimens in the Canadian National Collection from the vicinity of Keremeos in southern British Columbia appear on genitalic characters to belong here. They were taken June 8, 1935, along with a male of *sierrae*. They show a good deal of ruddy suffusion, and the antemedian band is darker than in topotypical specimens. In the same collection is a male specimen bred by the Forest Insect Survey from a larva on *Pseudotsuga taxifolia* (Poiret) Britton taken near Chase, British Columbia.

Hydriomena edenata edenata Swett

Plate 2, figure 10; text figures 27, 28, 135

Hydriomena edenata SWETT, 1909, Canadian Ent., vol. 41, p. 232; 1915, *ibid.*, vol. 47, p. 59. BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 31, pl. 3, figs. 5-8, pl. 6, fig. 14 (holotype), pl. 10, fig. 1 (male genitalia).

Edenata is one of the commonest species of early spring on the Pacific coast and at the same time one of the most perplexing ones, varying not only in size but also in maculation and coloration. It occurs from Vancouver Island in the north to San Diego County in the south. Its time of appearance in the northern regions occurs in April, but in central California (Sonoma and Napa counties) it emerges in March, and still farther south (Riverside and San Diego counties) it may appear as early as in January and February. Its flight, judging by the dated material examined, appears to be of fairly long duration in these southern regions, and fresh specimens from Palm Springs, Glendale, and other localities bear dates as late as April; this is possibly connected with the amount of rainfall in such regions. No information is available as to whether or not the occurrence of two generations has been definitely established.

The type series, after the correction of certain typographical errors in the original description, was said to consist of five females collected at Eden Vale, Monterey County, California, June, and one male, simply labeled "Monterey Co.," but probably from the same source. Two rather strange features occur in the above data: in the first place, according to the maps, Eden Vale is not in Monterey County but in the adjacent Santa Clara County and, further, the date "June" is dubious as the species normally flies in early spring. The 1917 revision hints, however, at a possible second generation based on San Diego specimens taken in June; these have not been examined. The holotype, a female in the Museum of Comparative Zoölogy, Harvard College, *ex* collection Swett, is figured in the 1917 revision (pl. 6, fig. 14). It has also been examined personally, and specimens in the Canadian National Collection have been labeled as agreeing with this type, both in coloration and genitalia. Three female paratypes in the American Museum of Natural History, *ex* Broadwell collection, have been

sent for study, and an illustration is given (fig. 135) of the genitalia of one of these specimens. The male allotype from the American Museum of Natural History, *ex* Grossbeck collection, was also before the author when this report was written. The figure in the 1917 revision (pl. 3, fig. 8) of a topotypical specimen matches this allotype excellently, both in size and maculation, and as far as can be seen without making a slide, the shape of the uncus of the allotype is much as in the illustration herewith given (fig. 27) of the same part in a specimen from Spring Mountain, Napa County.

In the maculation of the type series it should be noted that the black line I on the primaries is almost rigidly outwardly oblique, a characteristic which appears to occur more commonly in specimens from the counties of southern California than in those from north of the San Francisco Bay area, where a tendency is shown for the line to be slightly outwardly angled below costa, even when the remainder of the maculation is quite typical. The broad nature of the pale postmedian band is another characteristic found in the types but is not necessarily entirely constant. This band typically is strongly projected outward opposite the cell, with a tendency to coalesce with the pale area apicad of line IV. The types show a certain amount of ruddy suffusion over this area, a rather rare occurrence, although it is duplicated to a somewhat lesser extent in an otherwise quite typical female in the author's collection from Verdugo, Los Angeles County, and is found occasionally in specimens from Napa County. The dark streak in the brown antemedian band along the inner margin of the wing is one of the most constant features of the maculation. Owing in all probability to climatic conditions, very dwarfed specimens occur quite frequently in material from the southern section of California, notably Ojai, Ventura County, and Palm Springs, Riverside County. In general, however, it may be said that the typical maculation pattern is better maintained in this region than in the more northern sections of the state. Two varieties from San Diego County have been named by Wright, and these are being treated later as somewhat doubtful subspecies.

Of the specimens taken from the counties

north of San Francisco Bay, considerable material has been available for examination, collected chiefly by W. Bauer in Marin, Sonoma, Napa, and Lake counties. Of this, a series of three male and five female specimens in the author's collection from Spring Mountain, Napa County, taken in February and March, is regarded as typical, differing only slightly in the less rigid line I but showing the broad pale postmedian band and even a tinge of ruddy in odd specimens. The normal amount of individual variation occurs, chiefly in the amount of smoky sprinkling on the pale basal and postmedian areas, but nothing more than can be normally expected. One small female from Petaluma, Sonoma County, April 5, 1939, is also placed here, and a single male from Anderson Springs, Lake County, March 20, 1949, a variant from the balance of the series from this locality, definitely belongs with Spring Mountain specimens. According to information furnished by the collector "the Spring Mountain area is heavily wooded—pines, firs, oaks, maple, etc.—and at least 2000 ft. elevation." The main series from Lake County differs in several points of maculation and appears to have attained a rather doubtful subspecific status which is discussed below. The type of country is much the same as in the Spring Mountain area, but the elevation is said to be somewhat lower (1400 feet). In contrast to the above material a small series of specimens taken, according to the collector, "at practically sea level in more or less open country" in Sonoma and Marin counties presents a quite different appearance. These specimens are small, lack the dark dash along the inner margin, and are considerably suffused with olive-green. They apparently fly somewhat earlier in the season (February). The only apparent way to call attention to such variants is to accord them subspecific status, which is done below. Still farther north in Mendocino County (Laytonville) while occasional specimens are only slightly larger than the Spring Mountain specimens above mentioned, the majority of the material examined would fall, on account of the very large size, under *grandis*.

Finally a small series of four males and one female have been noted from the Yosemite Valley (Camp Cascades, 4000 feet, March) and the near-by locality of Mather, Tuolumne

County. The single female is quite typical *edenata*, even to the ruddy shading. The males are rather more suffused with smoky shading than the types, but subspecific status seems scarcely warranted on such minor details, at least at the present time. A single rather small male is in the author's collection which in maculation and genitalia appears to be fairly typical *edenata*; it bears the rather curious label "Mohawk, Plumas Co., Cal. 7.15.38 W. R. Bauer." The date of capture especially needs verification.

In the male genitalia one of the main characteristics is found in the forks of the uncus; these are separated by a deep, but rather variable, excavation and are bent inward and downward apically, terminating in a rather sharp point. There is the usual variation in the length and breadth of the neck as can be noted in the figures presented. The juxta plate is furnished with a narrow stalked base, the contour of the sides and the apical width showing a certain amount of variation. The female genitalia are not so characteristic, being of the normal type, with large digitabulum on the left proximal side of the bursa; the ductus bursae varies somewhat in length, being at times extremely long and rather narrow, with parallel sides as shown in the figure of *indistincta* (fig. 136); normally it is a little broader and shorter. These characters persist throughout the above-mentioned material, subspecific or otherwise. The palpi are long and rather blade-like, and the male antennae are quite thick, laterally compressed, but with little sign of serration along the ventral margin.

MALE GENITALIA: (Based on a Napa County specimen). Uncus with neck rather narrow, approximately equal in length to that of the forks; these are narrow, little expanded laterally, and with their apices bent inward and downward, terminating in a point in a very characteristic manner. Tegumen with a fairly distinct shoulder, following which the sides are slightly concave and expand gradually to base; inward chitinous projections near base large, triangular, terminating in long points. Transtilla processes long and thin, with the usual apical setae. Clasper broad, with a slightly sinuate ventral margin; valvula well rounded; costa with a chitinized strip, narrowing apically at its junction with the val-

vula; costobasal tubercles I and II present, tubercle I rather small, with a strong, sickle-shaped, chitinous ribbon, terminating in the usual small, bent hook; tubercle II large, placed obliquely, giving rise to a strong tuft of knobbed hairs and with a fine chitinized hair adjacent to tubercle I. Juxta plate with narrow stalked base, the sides directed obliquely outward and very slightly convex (at times rather irregular) to a broad apex with fairly strong lateral projections which bear the usual sparse tufts of long hairs; marginal thinly chitinized band present, most prominent in basal section, narrowing apically; space between base and margin of sacculus narrow; vestiture of plate consisting of numerous fine, fairly long setae. Anellus very finely spiculate. Aedeagus normal in length; vesica with a small, very faint cluster of thin cornuti (at times scarcely visible).

FEMALE GENITALIA: (Based on a paratype from the American Museum of Natural History). Quite normal in general appearance. Ostium membranous, funnel shaped, with broad opening and short neck terminating in the usual chitinous half collar. Ductus bursae well chitinized and rather long (length variable in individuals), with more or less parallel sides, the left side somewhat extended distally to join a large digitabulum situated in the normal position on the left proximal side of the bursa; distal margin of ductus feebly upwardly oblique from left to right; partial septum weak. Bursa rather small for the size of the adult, obliquely and narrowly oval, membranous, the dorsal attachment to the ductus near the distal end (somewhat variable in individuals but always in distal half of ductus).

TYPES: Holotype, female, Eden Vale, Monterey County, June (*sic*), in Museum of Comparative Zoölogy, Harvard College, *ex* collection Swett; allotype, male, Monterey County, in the American Museum of Natural History, *ex* collection Grossbeck; three female paratypes, same data as holotype, in the American Museum of Natural History, *ex* collection Broadwell.

DISTRIBUTION: The nymotypical subspecies appears to be more or less restricted to the coastal counties of California from the San Francisco Bay area southward, extending inland to the Yosemite Valley and in the

south into the eastern sections of Riverside and Los Angeles counties.

***Hydriomena edenata prasinata*, new subspecies**

Plate 3, figure 12

This subspecies is mentioned above in the text of the nimotypical race as occurring in open areas at about sea level in Sonoma and Marin counties, California.

In size it is somewhat smaller than normal specimens from Napa County, averaging a wing expanse, from tip to tip of primaries, of approximately 30 mm. In the coloration of the primaries the brown and ruddy shades are completely replaced by a dull olive-green, especially noticeable in the antemedian and terminal areas and affecting to a certain extent the paler basal and postmedian spaces which are variably suffused with the same shade, rendering them rather inconspicuous. Line I (subbasal) is thin and black, showing a weak angle below costa, then slightly incurved and strongly outwardly oblique in general direction, terminating in a slight black patch. Band II, crossing the darker antemedian area, is largely obscured by the olivaceous shading. Line III is more or less parallel to line I, very slightly wavy, with a stronger rounded incurve above inner margin, followed by a slight intensification of the black color. There is usually no sign of a dark dash preceding it along inner margin, but this dash is present in two of the paratypes from Novato. Line IV is best defined in costal and inner marginal areas, makes an inward angle in the cell, followed by a weak rounded projection, after which it bends inward, considerably narrowing the postmedian pale band which contains a minute discal streak. Band V narrow, of the usual purplish color, variably clear, according to the amount of olivaceous suffusion. A dark apical dash, partly connected with band V. Terminal margin with the veins edged with dark dashes. Fringes lightly checkered. Secondaries light smoky, at times deepening outwardly, and crossed by a distinct, dark, angled, postmedian line. Outer margin with a fine dark border line.

HOLOTYPE: Male, Inverness, Marin County, California, February 15, 1940 (W. Bauer), in the Canadian National Collection.

ALLOTYPE: Female, Novato, Marin County, California, February 16, 1951 (A. Heise), in the American Museum of Natural History.

PARATYPES: Four males, two females, same data as allotype, January 18, 26, 30, March 7, 11, 15, a pair of these in the Bauer collection, the others in the author's collection for the present. One male, Petaluma, Sonoma County, February 25 (W. Bauer), in Bauer collection; one male, one female, same data, February 27, April 18, in author's collection. Two males, Petaluma, California, February 7, 1940, and March 1, 1935 (E. C. Johnston), in the Canadian National Collection. One male, Petaluma, California, February 24, 1935 (E. C. Johnston), in the Los Angeles County Museum. One male, Petaluma, California, March 31, 1938 (E. C. Johnston), in collection Sperry.

Two male specimens from Inverness, Marin County, are larger and, although showing the green shades on the primaries, approach in maculation specimens from Spring Mountain, Napa County; these have not been included in the type series.

***Hydriomena edenata baueri*, new subspecies**

Plate 2, figure 11; text figures 29, 30

The specimens from Anderson Springs, Lake County, California, mentioned in the text of the nimotypical form, while not so strikingly different from the Napa County specimens regarded as typical, still show several points of distinction in maculation which appear to make a subspecific name advisable.

The size is on the whole larger, the average wing expanse, from tip to tip of primaries, being 32 mm. The salient points of distinction are found in the subbasal line (line I) which shows a very sharp outward angle below costa and in the pale postmedian band which is considerably narrowed, especially in the costal region. The general coloration is somewhat darker, the deep brown antemedian band being quite prominent and obscuring, at times almost completely, band II which passes through its median section. The subterminal area is considerably suffused with brown, occasionally with a slight admixture of ruddy, and the same type of darker suffusion is found in the terminal area. A variable amount of smoky sprinkling occurs in the paler basal and postmedian areas. The secondaries are pale brownish, with small dark discal dot and fairly obvious, bent, postmedian, and subterminal lines.

In the genitalia of both sexes there is no

striking difference, but occasionally a male specimen occurs with very narrow neck (fig. 29).

In a series of 12 males a single specimen was found that showed a maculation similar to that of the typical Napa County series. It is not surprising that such specimens occur in view of the fairly close proximity of the two localities.

Great pleasure is taken in naming the subspecies after that enthusiastic collector William Bauer, who has done so much to increase our knowledge of the insect fauna of the Petaluma region.

HOLOTYPE: Male, Anderson Springs, Lake County, California, March 20, 1949, in the American Museum of Natural History.

ALLOTYPE: Female, same locality and collector, March 26, in author's collection.

PARATYPES: Eight males, same locality and collector, March 20 and 26, 1949, one each in collection Bauer and the United States National Museum, the others in author's collection.

***Hydriomena edenata grandis* Barnes
and McDunnough**

Hydriomena edenata grandis BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 33, pl. 3, fig. 9 (allotype).

The subspecies was based on material from southern Vancouver Island, British Columbia, which is characterized principally by its much greater size (38 mm. expanse). The figure given of the allotype gives a good idea of size and maculation. Mention is made in the description of a certain amount of green shading, but in three topotypical pairs in the Canadian National Collection no indication of such coloration is noticeable, the basal and postmedian bands being quite pale and the antemedian band, subbasal, and terminal areas a deep brown.

Grandis ranges southward from Vancouver Island at least as far as Mendocino County, California. Specimens are in the author's collection from McMinnville, Oregon, and Laytonville, Mendocino County, and two females from the Sperry collection have been seen that were captured in Yakima County, Washington. Some of these are smaller in size and approach quite closely the nimotypical form. A single male from Medford, Oregon, Febru-

ary 20, shows considerable resemblance to the race *baueri* because of its very narrow postmedian pale band. In all these specimens variation in the shape of the subbasal line (line I) is noticeable; it may be rigidly outwardly oblique, slightly angled, or even rarely with the sharp angle below costa found in *baueri*.

TYPES: Holotype, male, Duncan, Vancouver Island, British Columbia, March 24-30; allotype, female, and two female paratypes, Victoria, British Columbia, April 8, 13, 16, all in the United States National Museum, ex collection Barnes; one female, paratype, Victoria, British Columbia, April 13, in the American Museum of Natural History.

DISTRIBUTION: Southern Vancouver Island (Victoria, Duncan); Washington, Yakima County; Oregon (McMinnville, Medford); California, Mendocino County (Laytonville.)

LARVAL FOOD PLANT: A single dwarfed female of what appears by the genitalia to be an *edenata* form was bred by the Canadian Forest Insect Survey from a larva on Douglas fir (*Pseudotsuga*) found at Colwood, a town in the vicinity of Victoria, Vancouver Island.

***Hydriomena edenata olivata* Wright**

Hydriomena edenata var. *olivata* WRIGHT, 1916, Ent. News, vol. 27, p. 460. BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 32, pl. 6, fig. 5 (cotype).

The status of this so-called subspecies is rather doubtful, and no specimen has been seen that can be definitely said to match the figure of a cotype given in the 1917 revision. Wright's description is vague and ambiguous. In his initial comparison with *glauca* he states that "the extra discal space is very narrow and the black bar is evident on the inner margin." In the actual description, however, he states "bar on inner margin lacking or but faintly indicated." He also mentions line I as "running in long even sigmoidal curves," "a dull mottled appearance" of the maculation, and "a distinct olive shade" that suffuses the whole surface of the primaries. With regard to the types all he states is "Types, three males, San Diego, California, collected by the author, one of which is in the Swett collection." No mention is made of any holotype. The Swett specimen is now in the Museum of Comparative Zoölogy, Harvard

College, and its figure seems to bear out the above-quoted paragraphs quite well. The other two types are in the San Diego Museum, and no information regarding them can be obtained at the present time. Should it be found that all three bear merely the designation "Type" on the label, it is proposed that the specimen figured in the revision be chosen as the lectoholotype; it is more easily accessible for examination.

Sometime ago, when the author was still at Ottawa, he received a specimen from the then curator of the San Diego Museum purporting to be a topotype of *olivata* and collected by Wright at San Diego, March 15, 1920. This specimen has been examined and does not seem to fit either the description or the figure of the Swett specimen at all well. It is too small, line I is practically rigidly oblique, and the maculation is quite distinct. The general coloration is a smoky brown, with paler basal and postmedian areas, and the only trace of a faint olivaceous coloration occurs as a border of bands II and V. Several other specimens from the San Diego region have been examined which are fairly similar to the above specimen; they vary in general color from gray to brownish and may be with or without the black bar on inner margin. For the present the identity of *olivata* must remain more or less of a puzzle, and it is impossible to determine whether its status as a subspecies is correct or not.

TYPES: Three males, San Diego, California, one in the Museum of Comparative Zoölogy, Harvard College, *ex* collection Swett, and the other two in the San Diego Museum of Natural History.

DISTRIBUTION: Doubtful; known only from the San Diego area.

Hydriomena edenata pallidata Wright

Hydriomena edenata var. *pallidata* WRIGHT, 1916, Ent. News, vol. 27, p. 460. BARNES AND McDUNNOUGH, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 32, pl. 6, fig. 7 (cotype).

As far as can be told from the limited material available for examination, *pallidata* represents what may be termed a subspecies, occurring in semi-desert areas of southern California. As the name indicates, and the figure given of a cotype shows, the ground color is a

dull grayish and the maculation is considerably reduced, leaving bands II and V the most prominent feature; these are as noted in the original description rather paler in color than usual and of "a light watery gray." Line I is thin, black, and rigidly oblique from costa to inner margin. The distinctness of the maculation is variable and inclined to be somewhat better defined in the males than in the females.

In the Canadian National Collection are a "topotype" female collected by Wright at San Diego, March, 1921, and a male from the same locality which the author compared with the cotype in the Museum of Comparative Zoölogy, Harvard College, some years ago and marked as agreeing. Several other specimens from this locality as well as a stained female from Glendale, Los Angeles County, March 27, are in the same collection. Apart from these, the only specimens examined are two females in the author's collection from San Diego and Glendale, respectively. In the male genitalia there is nothing distinctive; in three slides made of the female organ the ducti bursae are all of the very long, thin type shown in the illustration of *edenata indistincta*.

TYPES: Holotype, no sex given, locality presumably San Diego, California, but not stated; in San Diego Museum of Natural History, *ex* collection Wright. Paratype, male, San Diego, California, in the Museum of Comparative Zoölogy, Harvard College, *ex* collection Swett. A third paratype is said to be in the Marloff collection and is now probably in the Carnegie Museum at Pittsburgh, Pennsylvania.

DISTRIBUTION: Southern California (Los Angeles and San Diego counties).

Hydriomena edenata indistincta McDunnough

Text figures 31, 32, 136

Hydriomena edenata indistincta McDUNNOUGH, 1952, Amer. Mus. Novitates, no. 1592, p. 12, figs. 5, 6 (types).

Little can be added to the information contained in the original description. Two worn males have been found in the Los Angeles County Museum collection which bear the labels "near Phelan P. O. San Bern^{do} Co. Calif. March 28 & 30, 1934 (M. L. Walton)"; this

locality is not far distant from the type locality. Strange to say, a pair of much smaller and rather worn specimens which apparently belong to this form were collected by the Channel Islands Biological Survey of the Los Angeles County Museum on Santa Cruz Island March 23 and 26, 1941; the genitalia of both sexes are quite similar to those of the type series. There is a possibility that *indistincta* may prove to be specifically separable from *edenata*, but this cannot be determined until something of the life history is known.

It might be noted that the male palpi are slightly longer on the average than those of coastal *edenata*, and there is less difference between the two sexes in this respect. In fact, although in the allotype the palpi are long, certain other females in the series show palpi which have the same length as those of the males. The male antennae are rather thin, although considerably stouter than those of the female; they show virtually no serration along their ventral edges. Figures of the genitalia of both sexes are given for the sake of comparison; in the female genitalia a specimen with particularly long ductus has been chosen, a feature that occurs quite frequently in the typical form and has no particular value as a means of subspecific separation. In another female genitalic slide an incipient second digitabulum was present on the right distal end of the ductus, but, as already noted elsewhere, this is merely an individual variation.

Types: Holotype, male, upper Santa Ana River, San Bernardino County, California, May 9, 1947 (J. L. Sperry), in the American Museum of Natural History; allotype, same data, June 7, 1948, in author's collection for the present. Paratypes, as indicated in the original description, distributed in various of the larger museums.

Distribution: Higher altitudes in the San Bernardino Mountains; also apparently on the coastal islands (Santa Cruz Island).

***Hydriomena furtivata* McDunnough**

Plate 2, figure 17; text figures 33–35, 137

Hydriomena furtivata MCDUNNOUGH, 1939, Canadian Ent., vol. 71, p. 250.

Besides the type series and a few other topotypical males a small series of both sexes has been examined which was taken by G. and J.

Sperry on the south fork of the Little Colorado River, White Mountains, Arizona, July 27, 28, 1947. These latter specimens are slightly smaller than the type series but match excellently in maculation and also in the main in male genitalia. An examination of several male genitalic slides made from these specimens shows that considerable variation exists in the character of the uncus. While some agree well with the topotypical specimen figured (fig. 33) in possessing a short broad neck with lateral basal swellings, others show a considerably narrower neck and lack virtually any trace of the swellings. Nothing, however, in the maculation or palpal length would indicate specific distinctness, and this deviation from the more normal form is consequently regarded as merely individual. Such variation is not unusual in other species and should serve to emphasize the necessity for great care in evaluating minor genitalic characters. A figure is given (fig. 35) showing this deviation.

Heretofore the female sex was unknown, but two females have been found in the Little Colorado River series. One of these unfortunately had lost its abdomen, but a slide of the genitalia of the other shows considerable resemblance to those of *edenata*. The species seems therefore best placed next to this species in the present arrangement; the downward direction and pointed character of the apices of the uncus forks in the male would also bear out such a reference.

MALE GENITALIA: (Based on a topotypical specimen). Uncus neck short and broad, with very slight tubercular swelling on each side near base (in some specimens the neck is narrower and virtually lacks the lateral swellings); forks not greatly divergent with V-shaped excavation between them; the apices characteristically bent inward and downward and pointed. Tegumen broadening rapidly and rather short; little trace of a shoulder; inward chitinous projections near base small, triangular. Finger-like processes from transilla rather thin and short, with the usual scattered apical hairs. Clasper short and broad, with ventral edge only slightly sinuate; costobasal tubercles of usual size, the chitinous ribbon from tubercle I of moderate width, tapering to a hooked point; tubercle II with the usual knobbed hairs and a very

finely chitinized hair adjacent to tubercle I. Juxta plate broad apically and sharply narrowing to a definitely stalked base; the lateral margins are very slightly convex in the apical section but in general rather rigidly inwardly oblique; apical projections not very strong and the tufts of long hairs improminent; squamation of plate consisting of very fine, short setae, sparsely distributed; thinly chitinized marginal band inconspicuous but fairly broad in basal area; space between base and margin of sacculus quite broad. Spiculation of anellus quite strong. Vesica without armature. Aedeagus rather short and rather chunky in the proximal section.

FEMALE GENITALIA: Ostium, membranous neck, and chitinized half collar normal. Chitinized ductus bursae fairly long, with parallel sides and a large digitabulum situated in the normal position on the proximal left side of the bursa. Distal edge of the ductus only very slightly upwardly oblique from left to right. Partial septum moderately strong, curving distally somewhat to the right; a shorter, apparently second septum parallels it on the right side. Bursa rather small, sack shaped, its dorsal attachment to the ductus somewhat distad of the median section.

TYPES: Holotype, male, White Mountains, Arizona, May 26, 1934, in Canadian National Collection. Paratype males from the same general region in the Canadian National Collection, the Los Angeles County Museum, and collection Sperry. The only definite localities given are Hannigan's Meadow and Alpine.

DISTRIBUTION: Known so far only from various localities in the White Mountains, Arizona.

Hydriomena johnstoni, new species

Plate 3, figure 16; text figures 36, 37

A single male from the Sperry collection, taken originally by the late E. C. Johnston at Inverness, Marin County, California, presents such divergent characters in both coloration and genitalia from any of the known species in the group that it is considered as representing a new species. The author feels that it is a fitting tribute to a former active Californian collector to per-

petuate his name in the specific title of this interesting form. A detailed description follows.

Palpi projecting well beyond front, belonging to the "moderate" group of former revisions; deep black-brown. Male antennae thin, somewhat laterally compressed, with the ventral edge slightly serrate. Vestiture of head largely pale orange. Thorax clothed with an admixture of pale orange and black scaling; metathoracic tuft black. Primaries of a light olivaceous ground color considerably overlain, especially in the median area, with light pinkish, the general effect being that of a dull orange. Cross lines and bands distinct. Line I black, rather rigidly outwardly oblique, expanding to a slight black streak on inner margin. Band II broad, purplish, outer edge slightly serrate, slightly emphasized by black on inner margin. Line III irregularly outwardly oblique, thin, with slight thickening at costa and inner margin. Postmedian space narrow, especially at inner margin, where it is half as broad as at costa; broadest where it bulges outwardly crossing veins 3 and 4; veins crossing this area outlined in black; thin black discal streak. Line IV forming the outer margin of the postmedian space, black, irregular, thick between costa and vein 6, bulging between veins 2 and 4, then incurved and more or less parallel and quite close to line III, slightly thickened at inner margin. Band V purplish, irregularly curving, very broad in costal portion, narrowed medially, thickening again above tornus. A small dark apical patch and the usual two black transverse streaks subapically. Thin black terminal line. Veins terminally outlined, with short dark streaks on both sides. Fringes smoky, faintly checkered, basal area slightly olivaceous. Secondaries light smoky, with faint darkish discal dot and angled postmedian line; a thin dark terminal line. Beneath primaries light smoky, costa with dark spots in the place of upper side line IV and band V and continued faintly across wing as thin smoky bands. Secondaries paler than above, discal dot and postmedian line more distinct; an additional faint, thin band in the subterminal area. Expanse 22 mm.

MALE GENITALIA: Uncus with rather long and quite thin neck; forks rather short and

thick, curving gently outward, with apices bent inward and downward and pointed; incision between them short, U-shaped. Tegumen quite narrow, almost triangular, sides sloping evenly outward from thin apex, with only trace of a shoulder; inward chitinous projections short, pointed; the dorsal subdivisions, which are usually separated medially by a well-defined band, are almost connected, a fine chitinous line being the only sign of a separation; medially and caudad of these subdivisions is a thinly chitinized, semi-transparent patch. Transtilla processes thin and short. Clasper short and chunky, with sinuate ventral edge; costobasal tubercles normal; tubercle I with broad, sickle-shaped, chitinous ribbon; tubercle II with the usual tuft of knobbed hairs and a very fine chitinized hair adjacent to tubercle I. Juxta plate very characteristic, broad, shield shaped, with weakly convex sides, thickened in their apical half and again at extreme base where they are inwardly rounded to form a broad base; apical projections improminent, with the usual weak tufts of long hairs; thinly chitinized marginal band very narrow in apical half, broader basally. Vestiture of plate consisting of numerous thin setae arising from small papillae; space between base and margin of sacculus very narrow. Anellus finely spiculate. Aedeagus short, thin, vesica unarmed.

HOLOTYPE: Male, Inverness, Marin County, California, April 27, 1940 (E. C. Johnston), in collection Sperry.

Hydriomena divisaria divisaria Walker

Text figures 38, 39, 138

Cleora divisaria WALKER, 1860, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 21, p. 487. PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 457. BARNES AND MCDUNNOUGH, 1916, Contributions to the natural history of the Lepidoptera of North America, vol. 3, no. 1, p. 40.

Cleora diversaria, D'URBAN, 1861, Canadian Nat. and Geol., vol. 6, p. 39.

Hydriomena autumnalis HULST (*nec* Strömeyer), "1902" [1903], in Dyar, Bull. U. S. Natl. Mus., no. 52, p. 283 (*partim*).

Hydriomena pluviata BARNES AND MCDUNNOUGH (*nec* Guenée), 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 24, pl. 4, figs. 7, 8, pl. 6, fig. 16

(holotype *divisaria*), pl. 9, fig. 1 (genitalia). BARNES AND BENJAMIN, 1928, Pan-Pacific Ent., vol. 4, p. 134.

Hydriomena divisaria, MCDUNNOUGH, 1922, Ent. News, vol. 33, p. 229. MCGUFFIN, 1942, Canadian Ent., vol. 74, p. 153 (biology). FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem., no. 274, pp. 140, 141, figs. 151, 153 (?) as *frigidata* and *pluviata*. MCDUNNOUGH, 1951, Amer. Mus. Novitates, no. 1535, pp. 3-8, fig. 1E-I, fig. 2A (uncus), fig. 3A (juxta).

Wrongly placed as a synonym of *pluviata* in the 1917 revision, the necessity for raising *divisaria* to specific rank was stated by the author in 1922. This statement was considerably elaborated in a recent publication (1951) when adults and genitalic characters were illustrated. At this time the close resemblance between *divisaria* and the true *frigidata* was noted. After further study the conclusion has been reached that these two names represent races of a single species, the name *divisaria* having priority, and as such they are now treated.

Apart from its small size, the nimotypical form is characterized by its rather dull coloration, the ground color of primaries being a smoky white crossed by bands of light gray-brown. Considerable variation exists in the depth and extent of the darker color in the many regions where the species occurs, but any ruddy shading, as is characteristic of the race *frigidata*, is only very rarely met with and is then only feebly visible. In specimens examined it occurred in a male from Jefferson Notch, New Hampshire, and a female from Oscoda County, Michigan, other specimens from the same region being normal in coloration. The type male was collected in the Laurentian Mountains northwest of Montreal and the specimen figured in 1951 (fig. 1E) is a very close match. In eastern Ontario and Quebec provinces this is the normal form, and specimens from the Catskill Mountains, New York (Pearsall), in the American Museum of Natural History show little variation from the type; two such specimens are figured in the 1917 revision (pl. 4, figs. 7, 8). Farther west in New York State there appears to be a tendency to a darker suffusion of both forewings and hind wings, and the species attains subspecific rank, which is dealt with below.

In the United States the range of the species is known to extend to Indiana and Michigan, and it probably occurs throughout most of the New England states; very little material, however, from any of these regions has been available for study. In Canada *divisaria* ranges from New Brunswick and Cape Breton Island to Saskatchewan and Alberta, following the spruce belt, the larva being a feeder on conifers. A long series of specimens bred by the Canadian Forest Insect Survey in British Columbia has been examined. From a study of the locality labels on these specimens it would appear that the species occurs throughout the greater part of the province, collections having been made in the Fernie region in the southeast, the central section around Vernon where the forest laboratory is situated, and in the northern part of the Cariboo area extending along the line of the Canadian National Railroad as far north as Hazelton. Considerable variation in the coloration of the primaries was noticed; some of the specimens were quite normal in appearance; others showed a tendency towards a darker suffusion, especially in the antemedian band; in certain others there was a noticeable pinkish suffusion, especially in the outer half of the wing. None of these variations was restricted to individual regions, and obviously they do not represent racial forms. A few of the specimens, notably females, were much above the average size. The moth is on the wing from about mid June to early July.

The genitalia have already been figured both in the 1917 revision and in the recent paper of 1951, and an additional figure is now added (fig. 38) based on the adult figured as figure 1E in the latter article. There is the usual variation in the depth of the rather short excavation between the uncus forks, but in general it may be said that the neck is quite broad and the sides are virtually parallel to the tips of the forks, a character quite useful in separating the species from *transfigurata*. The presence of a weak cluster of cornuti in the vesica is also characteristic. This occurs in *renunciata*, but the great depth of the excavation between the forks separates the latter species very readily. The female genitalia possess a large hollow spine at the distal end of the chitinous ductus, situ-

ated medially at the termination of the partial septum. There are also single smaller spines on the basal edges of the digitabulum, both dorsally and ventrally. These spines vary in size but are always placed at right angles to the digitabulum edges, a useful means of separation from the very similar organ in *renunciata* where the dorsal spine points backward towards the large spine of the ductus. Occasionally small additional spines are present. A rare variant from a specimen from Oscoda County, Michigan, is figured (fig. 138). The dorsal attachment of the bursa to the ductus is considerably more distal than in *renunciata*.

MALE GENITALIA: Uncus neck rather short and broad, the sides more or less parallel right up to the rounded apices of the forks; excavation between forks not very deep but varying somewhat in this respect. Tegumen with no trace of shoulder, broadening rapidly from apex to base, the chitinous inward projection small, triangular. Finger-like processes from transtilla long and thin. Clasper short and chunky, with little incurve of the ventral edge medially; costobasal tubercles normal in size and shape; sickle-shaped chitinous ribbon from tubercle I moderately broad, tapering to a point apically; the usual thick cluster of knobbed hairs from tubercle II but no chitinized one adjacent to tubercle I. Juxta plate narrow, the sides sloping inward and rather evenly to a narrow stalked base; apical projections weak, with the usual clusters of long hairs; thinly chitinized marginal band generally weak and at times obsolescent; squamation of plate composed of fine, fairly long, scattered hairs; space between base of plate and dorsal margin of sacculus quite broad. Spiculation of anellus very fine. Aedeagus thin and short; vesica with improminent cluster of fine scattered cornuti.

FEMALE GENITALIA: Ostium, membranous neck, and collar normal. Chitinous ductus bursae broad and rather short, the left margin slightly concave, the right one tending to bulge outward towards the distal end. The length of ductus varies somewhat as usual, and there is a noticeable tendency to show a slight bend to the right. Partial septum weak, terminating in a strong hollow spine at the mediodistal edge of the ductus. Large digitabulum of varying shape at the

upper left corner of the bursa; both dorsal and ventral basal margins are furnished medially with a single small spine, rather variable in size, but placed at right angles to the edge. The membranous oval bursa is broadly attached to the dorsal side of the ductus, quite close to its distal edge.

TYPE: Holotype, male, Rouge River, Quebec, in Canadian National Collection.

DISTRIBUTION: In the United States it occurs in the northern Atlantic and New England states, ranging westward to Indiana and Michigan, and will probably be found in Wisconsin and Minnesota. In Canada it ranges from Newfoundland and the northern portion of Nova Scotia through New Brunswick, Quebec, and Ontario westward to Saskatchewan, Alberta, and the mainland of British Columbia.

LARVAL FOOD PLANTS: The predominant food of the larva is spruce (*Picea*). In British Columbia from 58 specimens examined 36 were beaten from *Picea*; of the others, 14 occurred on Douglas fir (*Pseudotsuga*), four on balsam fir (*Abies*), and four on pine (*Pinus*). The same ratio was observed in material from other provinces of the Dominion. To these food plants must be added larch (*Larix*) according to four specimens bred by the Forest Biology Laboratory at Winnipeg, Manitoba.

Hydriomena divisaria brunescens,
new subspecies

Plate 1, figure 12

A series of specimens received from J. G. Franclemont and collected in the vicinity of Ithaca, New York, shows constantly a strong suffusion of a bright brown color over the entire primaries, obscuring to a large extent the postmedian band. This band in the nymotypical form is quite pale and contrasts with the darker antemedian band to a considerable extent, whereas in the present form it is quite unnoticeable. The brown color lacks the gray tone of typical *divisaria* and at times verges into almost a ruddy character. The secondaries in the females are quite dark. This color variation may possibly be due to a difference in the food plant of the larva. Typical *divisaria* is normally a feeder on spruce, and it has been stated by the collector that no spruce occurs in the vicinity

of Ithaca where the conifers are largely hemlock with scattered white pine. Mr. L. R. Rupert reports that the few specimens he has secured in the neighborhood of Horseheads, New York, were collected in an area where hemlock abounded. These specimens were examined in 1951 and later returned, but it was noted at the time that they were more suffused with brown than usual; consequently they would be a good match for the present series. There are no obvious genitalic differences. The female allotype is figured.

HOLOTYPE: Male, McLean Bogs Reserve, Tomkins County, New York, May 30, 1946 (J. G. Franclemont), in collection Franclemont.

ALLOTYPE: Female, Ithaca, New York, June 11, 1935 (J. G. Franclemont), in collection Franclemont.

PARATYPES: One male, four females, same locality and collector as allotype, May 26, June 5, 7, 11, 20; two females, same data as holotype, June 4, 9; one male, one female, Six Mile Creek, Ithaca, New York, June 5, 9 (Franclemont). These are in the collection of Franclemont and that of the author, and will be later distributed among various museums.

Hydriomena divisaria frigidata Walker

Plate 1, figures 13–21; text figures 40, 41, 139–141

Cidaria? frigidata WALKER, 1862, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 26, p. 1729. PACKARD, 1873, Fifth Rept. Peabody Acad. Sci., p. 88 (*err. det.*). HULST, 1895, Ent. News, vol. 6, p. 43 (*err. det.*).

Hydriomena autumnalis HULST (*nec* Strömeyer), "1902" [1903] in Dyar, Bull. U. S. Natl. Mus., no. 52, p. 283 (*partim*). SWETT, 1912, Canadian Ent., vol. 44, p. 228 (*err. det.*).

Hydriomena pluviata BARNES AND MCDUNNOUGH (*nec* Guenée), 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 24 (*partim*).

Hydriomena frigidata, MCDUNNOUGH, 1951, Amer. Mus. Novitates, no. 1535, pp. 2–8, fig. 1A–D, fig. 2B–E (uncus and aedeagus), fig. 3B, C (*juxta*).

As already noted, *frigidata* is now considered to be a race of *divisaria*, occurring in the southern half of Nova Scotia and characterized in general by the darker coloration of the primaries and the frequent occurrence of considerable ruddy suffusion, especially

over the pale postmedian band. The subspecies has been discussed at considerable length in a recent article (1951). Since then, collecting in Halifax County (Mount Uniacke, Port Wallis, Ship Harbour) has produced much larger series of fresh specimens than were available at the time of the previous discussion, and from these the extreme variability of the race has been evident. The general trend of variation seems to be towards a darkening of the coloration, notably of the pale basal area; the postmedian pale band shows at times a tendency towards contraction between vein Cu_2 and the inner margin, and this area is often separated as a white spot by a dark line along the vein. The subbasal dark line (line I) seems the most constant feature of the maculation. In a few specimens the ruddy suffusion is replaced by a pale green shade, and in one instance an almost total melanism has been found. It has been further noted that much larger specimens than usual occur with the normal sized forms, notably in the females, and especially those from the Annapolis Valley region. Such specimens show nothing in the genitalia to indicate specific differentiation. The illustrations given (pl. 1, figs. 13–21) depict some of these variants.

The male genitalia match those of the nymotypical race quite well and show the same tendency towards variation in the depth of the excavation between the uncus forks. This was illustrated in the 1951 paper, and a further illustration is now given of the organ in the figured male from Mount Uniacke. In the female genitalia of the larger forms the spines of the margins of the digitabulum are quite variable in shape and size, and in some instances small accessory spines occur; the ductus also tends at times to show a slightly greater length than in the smaller form. Such diversification falls, however, readily within the scope of individual variation. Some illustrations of this are given based on the three specimens figured which were all captured at Mount Uniacke on the same night, June 22, 1951; the order of the drawings is the same as that of the figured adults.

TYPE: Holotype, male, Nova Scotia (Redman), in the British Museum (Natural History).

DISTRIBUTION: Southern half of Nova

Scotia (Halifax County, Annapolis Valley region, ranging southward to Shelburne County).

LARVAL FOOD PLANT: Among material submitted by the Dominion Forest Insect Laboratory at Frederickton, New Brunswick, were several specimens bred from *Picea glauca* which belong to this subspecies. The larvae were collected in Halifax County; Richmond County, southern Cape Breton; Windsor, Hants County, Nova Scotia; and Charlotte County and Canaan River in New Brunswick. This extends somewhat the range of *frigidata* but still limits it more or less to coastal regions.

Hydriomena renunciata Walker

Plate 2, figures 2–7; text figures 42, 43, 142, 143

Ypsipetes pluvialis GUENÉE, 1857, Histoire naturelle des insectes, vol. 10, p. 378 (*partim*, female, not male). OBERTHÜR, 1920, Études de lépidoptérologie comparée, vol. 17, p. 203, pl. 507, fig. 4237. BARNES AND LINDSEY, 1921, Ent. News, vol. 32, p. 254. McDUNNOUGH, 1922, Ent. News, vol. 33, p. 229. BARNES AND BENJAMIN, 1928, Pan-Pacific Ent., vol. 4, pp. 134–135.

Larentia? renunciata WALKER, 1862, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 24, p. 1187. PACKARD, 1873, Fifth Rept. Peabody Acad. Sci., p. 88 (*err. det.*).

Hydriomena trifasciata PACKARD (*nec* Borkhausen), 1876, A monograph of the geometrid moths . . . of the United States, p. 91, pl. 8, fig. 29 (*partim*).

Hydriomena autumnalis HULST (*nec* Strömeyer), "1902" [1903], in Dyar, Bull. U. S. Natl. Mus., no. 52, p. 283 (*partim*). SWETT, 1912, Canadian Ent., vol. 44, p. 228.

Hydriomena renunciata, BARNES AND McDUNNOUGH, 1914, Contributions to the natural history of the Lepidoptera of North America, vol. 2, no. 5, p. 204; 1917, *ibid.*, vol. 4, no. 1, p. 25, pl. 4, figs. 10, 11, pl. 9, fig. 2. FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem., no. 274, pp. 140–142, fig. 150.

Hydriomena autumnalis var. *nigrescens* SWETT (*nec* Hoyningen-Heune), 1912, Canadian Ent., vol. 44, p. 228.

Hydriomena renunciata form *pernigrata* BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 25 (*partim*). McDUNNOUGH, 1927, Canadian Ent., vol. 59, p. 241.

The original description was based on three females from St. Martin's Falls, Albany

River (Barnston), United States (Doubleday), and Orillia, West Canada (Bush). Of these, according to information furnished by Mr. D. S. Fletcher, the only existing type in the British Museum is the specimen presented by Doubleday, and this is without abdomen. The locality given, "United States," is extremely vague, but it seems probable that it was one of the specimens taken by Doubleday at Trenton Falls, central New York State, where he is known to have done considerable collecting. This specimen has been examined carefully, and there seems no doubt that the species was correctly identified in the 1917 revision; a figure of this type is presented (pl. 2, fig. 2).

In the eastern Atlantic and New England states and in the eastern provinces of Canada, particularly Nova Scotia, *renunciata* is one of the commonest species of *Hydriomena*. It is the closest of our North American species to the European generotype, *coerulata* Fabricius, and for a long time was recorded under one of the synonyms, either *autumnalis* Strömeyer or *trifasciata* Borkhausen. As a matter of fact, after a comparison of genitalic slides of both sexes, made from British material kindly furnished by Mr. D. Fletcher, with our numerous North American slides the differences were found to be so slight that *renunciata* might readily be considered as a mere race of *coerulata*. However, for the present, no harm is done in retaining its specific status as was done in the 1917 revision. Besides being common, it is extremely variable in coloration and maculation. The typical form is one in which the postmedian band of the primaries is rather pale and fairly distinct from the much darker antemedian band. A gradual suffusion of this paler area with smoky scaling may occur, reaching its climax when the whole wing is suffused to such an extent that little of the maculation is evident. In the other direction a further paling of the postmedian band may occur, combined frequently with a broadening of the area, and in such cases this pale band becomes quite prominent and may even be suffused with a pale greenish tinge. One of the most striking and rather rare forms in the east occurs when the antemedian dark band becomes quite pale on both sides of the blue-black band II, the same paling occurring in

the subterminal area, leaving band V equally prominent; such specimens approach the western race *columbiata*. Some of the more striking forms from Nova Scotia are figured (pl. 2, figs. 4-7).

Useful features in determining the species are found in the very oblique black subbasal line (line I) and its slight biangulate character; also further in the generally broad, dark band V, especially at costa. Best of all characters, however, occurs in the male genitalia in which the incision between the uncus forks is very deep and the forks themselves are consequently very long with the neck quite short. No other species in the northeastern States and eastern Canada shows this character, and it may be readily seen by the removal of a few scales at the end of the abdomen. The females cannot be so readily determined and are best placed by comparison with definitely determined males. The flight of the species in Nova Scotia is a long one. In certain localities (Bridgewater) it has been taken during the last week of May, and all through June and early July fresh specimens can be collected at light in almost any locality. In Cape Breton and the Gaspé Peninsula it hardly appears before July. The same lengthy flight period appears to occur in New York State, judging by a long variable series collected in the vicinity of Ithaca by J. G. Franclemont.

The male genitalia show the same variability that has been found in the maculation of the primaries. The incision between the forks of the uncus is always deep but is scarcely ever exactly similar in any two specimens. The illustration given (fig. 42) is that of an average specimen. The incision is at times shorter than depicted, in which case the uncus neck may appear longer and often considerably thicker; the width between the forks may either widen as the forks become more outwardly bowed, or, on the other hand, narrow considerably in cases where the lateral edges are more or less parallel from base to apex. In doubtful cases, if there is any danger of confusion with *divisaria*, the presence of long apical setae on the ventral sides of the forks is characteristic. The juxta plate is frequently wider at the apex than in the illustration, and the base may also be somewhat wider and appear less stalked. In all

cases, however, that have been examined the apical projections are prominent but without the long tufts of hair usually present in this area (possibly because of abrasion); the marginal, thinly chitinized band is also broad and prominent. The female genitalia show considerable similarity to those of *divisaria*, possessing the same type of spine at the distal termination of the partial septum in the ductus bursae. The large digitabulum on the left side is also provided with spines on its dorsal and ventral basal edges, these varying considerably in size. The fact that the dorsal attachment of the bursa to the ductus is much more proximal than in *divisaria* is one of the best means of separation from this species. The spine on the ventrodorsal edge of the digitabulum is also quite characteristic. Instead of projecting at right angles to the edge as occurs in *divisaria*, it is directed inward and backward, pointing more or less to the central spine of the ductus. In a few instances an incipient digitabulum has been observed on the right distal end of the ductus, this occurring in one case in a specimen bred from a larva found in the Halifax area on *Alnus*, the normal food plant. This might be attributed to hybridization with *ruberata* which shows a similarly placed, small digitabulum, but on the whole it seems better to attribute it to individual variation, as a similar type of variation has been noted in several other species. In a series of specimens collected in the McLean Bogs Reserve, Tomkins County, New York, by J. G. Franclemont such variation occurs quite commonly.

The position of the species in relation to others of the group is a little uncertain. Based on the type of uncus in the male, it would be placed with other species with similar long uncus forks such as *californiata* and *chiricahuata*. The female genitalia, however, point to a close relationship to *divisaria*, these two species being the only ones which show spines on the lower edges of the digitabulum as well as a mediodistal spine on the ductus bursae. It has been decided to place more emphasis on female characters than on the male ones.

MALE GENITALIA: (Based on specimens from Armdale, Nova Scotia, and the Gaspé Peninsula, Quebec). Uncus neck short, varying in width from moderately broad to very broad; forks broad, long, and semiparallel,

their apices rounded and little depressed, furnished with long setae on ventral side; incision between forks very long (quite variably so) and narrowly U-shaped. Tegumen without shoulder or with only indication of same, broadening rapidly towards base; inward chitinous projections broadly triangular. Finger-like processes from transtilla rather short and chunky (somewhat variable in shape). Clasper very broad and chunky, with little median incurve of ventral edge; costobasal tubercle I of moderate size with a broad, sickle-shaped, chitinous ribbon, rather shorter than usual; tubercle II very large and obliquely triangular, with the usual cluster of knobbed hairs and with a distinct, fine, chitinized hair adjacent to tubercle I. Juxta plate broad apically, with the projections moderate in size but not furnished with the customary tufts of long hairs; lateral edges rounded outwardly at apex, then directed obliquely inward (at times slightly irregularly) to a narrow stalked base (this may, in some instances, be broader with less of a stalked appearance); marginal, slightly chitinized band broad and frequently continuous from base to apex; vestiture of lateral areas of plate composed of moderately long, fine, scattered setae; space between base and edge of sacculus narrow. Anellus finely spiculate. Aedeagus long and rather thin; vesica with distinct cluster of fine, loosely placed cornuti.

FEMALE GENITALIA: (Based on specimens from Armdale, Nova Scotia, and Baddeck, Cape Breton Island). Ostium, short membranous neck, and chitinized collar normal. Ductus bursae well chitinized, normally long with subparallel sides (occasionally shorter and bent somewhat to the right); partial septum well developed, terminating in a hollow spine on the mediodistal margin, variable in size; on the left side the distal end of the ductus bends outward and terminates in a large digitabulum situated on the upper left corner of the bursa; this digitabulum shows a blunt spine on its basoventral edge and, on the corresponding dorsal edge, another spine, somewhat smaller and directed inward and backward. Membranous bursa oval and smaller than usual, its dorsal attachment to the ductus situated far back in its proximal section.

TYPE: Holotype, female, "United States,

Doubleday," in the British Museum (Natural History).

DISTRIBUTION: Probably very generally distributed throughout the northern Atlantic and the New England states wherever the larval food plant, *Alnus*, occurs. Specimens from Columbus, Ohio, and Oscoda County, Michigan, have been examined, and the species will doubtless be found in adjoining northern states. In Canada it occurs from Newfoundland and the Maritime Provinces through Quebec, Ontario, and Manitoba to Alberta; specimens from the northern and inland portions of British Columbia (Stickeen, Kaslo, Osoyoos) show little difference in size and coloration from the darker forms of the east. A few specimens from the north-eastern section of Oregon and from Wallace, Idaho, are also very similar, and some of them are even smaller in size than normal Nova Scotia specimens. In the Sperry collection are two male specimens from Eel River, Mendocino County, California, and a series of five males and four females from Plaskett Meadows, Glenn County, California, which also agree with darker eastern forms and certainly would be misplaced under *pernigrata* Barnes and McDunnough as typified by the larger Glacier Park, Montana, specimens (*vide* 1917, "Revision," pl. 4, fig. 12). A single specimen from Rocky Mountain National Park, Colorado, 9500 feet, July 22-23, shows little difference from the dull-colored specimens from the interior of British Columbia. In a miscellaneous lot of unidentified material sent from the Canadian National Collection a small series of this species occurred which had been captured at Dawson, Yukon Territory, June 23, 1949, 1100 feet altitude, by P. F. Bruggemann. Apart from their somewhat smaller size, the specimens showed little difference from Nova Scotia material.

LARVAL FOOD PLANT: Alder (*Alnus*).

***Hydriomena renunciata columbiata* Taylor**

Text figure 144

Hydriomena autumnalis var. *columbiata* TAYLOR, 1906, Canadian Ent., vol. 38, p. 399. SWETT, 1912, Canadian Ent., vol. 44, p. 227. BARNES AND MCDUNNOUGH, 1912, Canadian Ent., vol. 44, p. 274.

Hydriomena renunciata race *columbiata*, BARNES

AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 25, pl. 4, figs. 13, 14 (type). MCDUNNOUGH, 1927, Canadian Ent., vol. 59, p. 241. FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem., no. 274, p. 142.

The name *columbiata* was proposed in a subspecific sense for a large form occurring on Vancouver Island and differing in its pale coloration and greenish suffusion from the eastern species, known at the time as *autumnalis*. In 1917, it was transferred to *renunciata* by Barnes and McDunnough as a subspecies, and a figure of the male holotype was given (*op. cit.*, pl. 4, fig. 13). As has already been noted under the nomenclotypic race, *columbiata* is an enlarged reproduction of one of the rarer eastern forms. It is characterized by the pale, rather bluish green suffusion over the greater part of the primaries, eliminating the broad dark antemedian band and the terminal dark shading, and allowing the dark bands II and V to stand out very prominently. It appears to be essentially a coastal form, extending northward on Vancouver Island to Skagway and Ketchikan on the southern tip of Alaska; on the British Columbia mainland it reaches inland along the Fraser River valley at least as far as Seton Lake and Lillooet. Southward it occurs in slightly modified form in Washington State (Verlot, Snohomish County; Rosemary Inn, Olympic Mountains, in Sperry collection).

The size of *columbiata* is, on the average, considerably larger than eastern *renunciata*, and, when freshly emerged, the specimens are strikingly beautiful with their pale green shades and dark bands. Unfortunately most of the material available for study has been worn, and in such cases the green color disappears and the whole forewing has a drab appearance. Some actual variation does occur at times in the depth of the coloration, and odd specimens in a series from any one locality may show a tendency towards a more or less evident smoky suffusion resembling in this respect *pernigrata*. In general, however, the color characters mentioned above hold good.

In the genitalia there is nothing radical by which the Vancouver Island race can be separated from the eastern form, although

in one male long hairs on the projections of the juxta plate were observed. In the female the attachment of the bursa to the dorsal side of the ductus is rather more distad than in eastern *renunciata*, possibly owing to the slightly longer character of this section.

TYPES: Holotype, male, Wellington, Vancouver Island, British Columbia, May 16, 1904 (United States National Museum, *ex collections* Taylor and Barnes). Paratypes, two specimens, same locality (United States National Museum).

DISTRIBUTION: Northern Pacific coastal region from southernmost Alaska to Washington State. Typical on Vancouver Island, British Columbia, and in the lower Fraser Valley of the mainland.

REMARKS: Judging by an examination of a series of specimens bred by the Canadian Forest Insect Survey from larvae on *Alnus*, collected in various coastal localities of the mainland and Vancouver Island, and also from the lower Fraser Valley region, the typical greenish coloration of the primaries is not at all constant, and many specimens show the same smoky coloration that occurs in most of our typical eastern *renunciata*.

Hydriomena renunciata pernigrata
Barnes and McDunnough

Plate 2, figure 8; text figure 146

Hydriomena columbiata form *pernigrata* BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 25, pl. 4, fig. 12 (holotype).

Pernigrata was described as one of the smoky colored forms of *columbiata*, but very unfortunately the types were designated as two males and one female from Glacier Park, Montana, a locality where, from our present knowledge of the race, it is evident that *columbiata* does not occur. No further material from the type locality is known, and the author is possibly stretching a point in assuming that the smoky coloration is normal for specimens from this region. It is certainly the case with all material so far collected in the higher altitudes of the California Sierras; two such specimens were indeed actually mentioned in the description of *pernigrata* but not designated as paratypes.

Under the circumstances it has been decided to raise *pernigrata* to subspecific status,

an action which it is perfectly well realized is not quite in accordance with the present-day interpretation of the International Rules of Nomenclature but which seems to be the simplest way out of the unfortunate situation. The types of *pernigrata* have been carefully examined and, although rather worn, are very similar in appearance to material from the Sierras (Plumas County; Lake Tahoe), and both show the typical *renunciata* type of genitalia. A female from Mohawk, Plumas County, is figured.

The name *pernigrata*, therefore, as here treated, is applied to a large race of *renunciata*, occurring in northern Montana and the California Sierras, in which the ground color is suffused with smoky and the maculation considerably obscured, with the exception at times of a still darker antemedian band. In the Sierras it flies during the first half of July.

TYPES: Holotype, male, allotype, female, and paratype, female, Glacier Park, Montana, in the United States National Museum.

DISTRIBUTION: Montana (Glacier Park); California Sierras (Mohawk, Plumas County; Meek's Bay, Lake Tahoe; Lassen Volcanic National Park; Lake Independence, Nevada County).

REMARKS: The paratypes mentioned in the original description from Skagit Basin and Stickeen River, British Columbia, are dark forms of *columbiata* and cannot be considered as representing *pernigrata* under the present restriction.

***Hydriomena renunciata viridescens*,**
new subspecies

Plate 2, figure 9; text figures 44, 45, 145

From the coastal regions of central California a few specimens have been received which differ in certain respects from the more northern race *columbiata* and seem worthy of subspecific status. The green suffusion of the primaries is of a different shade from that of *columbiata* and more evenly distributed over the whole wing. It approaches a pale emerald color rather than the slightly blue-green color of Vancouver Island material and the dark cross bands II and V do not stand out nearly so prominently. These differences are difficult to describe, and the specimens really need to be seen before their different appearance can be appreciated.

Very little material has so far been collected and that from scattered localities. The two males taken by W. Bauer in Marin County are in good condition and have been named holotype and paratype, respectively, the former being figured (pl. 2, fig. 9) as well as its genitalia (figs. 44, 45). A drawing of the female genitalia of a paratype (fig. 145) is also given. These genitalic figures show only slight differences from similar organs in *renunciata columbiata*.

HOLOTYPE: Male, Inverness, Marin County, California, May 1, 1947 (W. Bauer), in the author's collection for the present.

ALLOTYPE: Female, Van Damme State Park, Mendocino County, California, May 17, 1947 (F. Rindge), in the American Museum of Natural History.

PARATYPES: One male, same data as holotype, in collection W. Bauer; one female, Russian Gulch, Mendocino County, California, June 22, 1939, in Los Angeles County Museum; one female, Laytonville, Mendocino County, no date, in Canadian National Collection; one male, Klamath, Del Norte County, California, in collection Sperry.

Hydriomena transfigurata transfigurata
Swett

Plate 2, figures 12, 13; text figures 48, 49, 148

Hydriomena transfigurata SWETT, 1912, Canadian Ent., vol. 44, p. 195 (*partim, nec female*); 1912, *ibid.*, vol. 44, p. 228; 1918, *ibid.*, vol. 50, p. 294. McDUNNOUGH, 1951, Amer. Mus. Novitates, no. 1535, pp. 10-12, fig. 1M (holotype), fig. 5D, E (genitalia).

The unfortunate confusion in the type series of this species has been explained in the author's 1951 article where the name was restricted to the type male, chosen as lectoholotype and figured on figure 1M and figure 5D, E (genitalia).

Since then, through the courtesy of Mr. C. P. Kimball, a small series of two males and three females, collected at Barnstable, Massachusetts, in late May, has been received and found to belong undoubtedly to this species. The close resemblance to the false *frigidata* of the 1917 revision, for which the name *manitoba* Barnes and McDunnough appeared available, was noted in the above article. Further study of the new material makes it apparent that the two names, *transfigurata*

and *manitoba*, refer to a single, very variable species. As the name *transfigurata* has priority over *manitoba*, it must necessarily be used as the specific name; *manitoba* can, however, still be employed in a subspecific sense for a somewhat darker-colored form occurring in the Middle West and spreading eastward. As a matter of fact, the differences between the two subspecies are very slight and not altogether constant, owing to the marked variability of the species in any one locality. At the present time it seems, however, best to retain both names in the above-mentioned sense. As thus restricted, the nymotypical race would appear to occur largely in coastal areas. The type series was collected in the vicinity of Boston, and the above-mentioned Barnstable specimens are thus nearly topotypical. Besides these a series of five males and one female, collected in late May at Weston, Massachusetts, and received from Dr. A. E. Brower, has been examined and placed under this name. A single large male from Hampton, New Hampshire (S. A. Shaw), is also quite typical. Two females, one from New Canaan, Connecticut, May 8, 1951 (M. Statham), and the other from Central Park, Long Island (C. Kircher), in the American Museum of Natural History also belong here. The latter specimen is most interesting as it is labeled as bred from a larva on "pine," the only food plant record known to the author. Farther south the species was formerly taken in considerable numbers at Lakehurst, New Jersey, by the late F. Lemmer whose collection is now incorporated in that of O. Buchholz of Roselle Park, New Jersey. A single male from Bear Mountain, New York, has also been seen. These more southerly specimens may possibly represent a good race, as the color of the primaries tends more towards a yellowish green than to the pale green shade of more northerly forms. This color, however, may be due to age or to the fading of the green when the specimens were being relaxed for spreading. Until freshly caught material is available for study, it seems hardly feasible to propose a subspecific name. Finally a few specimens have been collected in the vicinity of Annapolis Royal, Nova Scotia, which constitute the only known record for eastern Canada.

In typical specimens the pale greenish

basal and postmedian areas of primaries contrast rather strongly with the darker antemedian and terminal areas which are more of an olive-brown color, crossed by the usual purplish bands II and V; the pale postmedian band is quite variable in width but on the whole is greatly constricted above the inner margin; the black cross lines I, III, and IV are normally well defined. These characters can be observed in the above-mentioned figure 1M of the male holotype. In some specimens, notably females, the cross lines are much fainter and the whole wing is suffused with a pale greenish which obscures the maculation considerably. A male of such a form from Weston, Massachusetts, is figured (pl. 2, fig. 13).

In palpal length the species belongs in the "moderate" group, but in many cases the palpi of the female are noticeably longer than those of the male and could almost be considered as "long." The male antennae are rather thin, laterally compressed as usual, and show no trace of serration on their ventral edges.

A second species, the flight of which occurs at the same time and in the same localities, is *pluviata*. The maculation of these two distinct species is disconcertingly close and has led to numerous errors of identification, notably in the type series of *transfigurata*, of which the type female and at least one of the paratypes belong to *pluviata*. Apart from the quite distinct genitalia, no character has been found in the maculation by which the two species can be definitely separated. It might be mentioned that the oblique line I in *transfigurata* is inclined to show a slight incurve below the cell, whereas in *pluviata* it tends to be gently convex, but such differences are not entirely constant. In the small series collected at Barnstable, for instance, two females which had been placed as *transfigurata* were found, after genitalic slides had been made, to belong to *pluviata*.

The male genitalia show considerable resemblance to those of *divisaria*; the uncus neck is, however, narrower, and the forks are curved outward to a considerably greater extent. The sides of the juxta plate are more convex than those of *divisaria*. The surest means of separation is the lack of the cluster of fine cornuti in the vesica. The female

genitalia are totally distinct. The ductus bursae is much twisted in its distal section, and there are two digitabula, one placed at the twisted end of the ductus and the other and much larger one placed more or less dorsally on the left basal section of the bursa. On account of the twisted nature of the organ hardly any two slides show exactly the same contours, and a comparison of the figure given in the present article (fig. 148) with that of *manitoba* in the 1951 paper will give some idea of the range of variation to be expected. A more detailed description of the organs of both sexes follows.

MALE GENITALIA: (Based on Barnstable specimens). Uncus with the neck variably narrow, the forks considerably outcurved, with a moderate U-shaped excavation between them; apices slightly pointed and directed inward. Tegumen rather narrow, with little trace of a shoulder and with the basal inward projections small and pointed. Finger-like processes from the transtilla thin and quite long. Clasper short and broad, with slightly sinuate ventral margin; costobasal tubercles well developed, especially tubercle II; the single chitinated ribbon from tubercle I quite broad and sickle shaped, its apex pointed and slightly hooked; tubercle II with a strong tuft of knobbed hairs but without a chitinated hair adjacent to tubercle I. Juxta plate broad, with convex sides converging towards the base to form a decided stalk; the outer, thinly chitinated margins very narrow; apical projections strong, with the usual tufts of long hairs; the balance of the plate except median area sparsely covered with very fine, moderately long setae; a broad space between base of plate and sacculus margin. Anellus very finely spiculate. Aedeagus normal, with no cornuti in the vesica.

FEMALE GENITALIA: (Based on specimens from Barnstable). Ostium, membranous neck, and collar normal. Ductus bursae strongly chitinated, bending considerably to the right in its apical section and curving ventrad, its distal edge forming two large incurves, separated by the end of the septum. This is very strong and deep, almost entirely separating the ductus into two sections. There are two digitabula: the smaller one is variably attached to the bursa either to the left of the

septum or partially on its right side; the very large one is more or less dorsally placed on the upper left section of the membranous bursa; the two are connected by a strip of very thin chitin. The attachment of the rather small membranous bursa to the ductus occurs at its distal right-hand edge, and in consequence the terminal portion of the ductus and a large section of the second digitabulum, when viewed ventrally, are covered by the membrane.

TYPE: Holotype, male, Forest Hills, Massachusetts, May 16, 1911, in Museum of Comparative Zoölogy.

DISTRIBUTION: Atlantic coastal area, extending from the Annapolis Royal region of Nova Scotia through southern New Hampshire (Hampton) and Massachusetts (Boston area, Weston, Barnstable) and Connecticut (New Canaan) to New York (Bear Mountain, Central Park, Long Island) and New Jersey (Lakehurst region).

LARVAL FOOD PLANT: Pine (*Pinus*).

REMARKS: Apart from the paratype male from Cohasset, Massachusetts, in the United States National Museum, *ex* collection Barnes, and the allotype female from Forest Hills, Massachusetts, both of which belong to *pluviata*, the location of most of the paratype material is unknown. A paratype female from Newfoundland in the Museum of Comparative Zoölogy, Harvard College, belongs to *renunciata*. Another paratype male from Forest Hills, Massachusetts, is in the same collection, but its identity has not been determined. The remaining paratypes which, according to the original description, consisted of six males and two females were said to be placed in the collection of the Boston Society of Natural History. This collection has now been broken up and was supposedly turned over to the Museum of Comparative Zoölogy, Harvard College, but this material has not been discovered in the museum's collection.

***Hydriomena transfigurata manitoba* Barnes and McDunnough, new status**

Text figures 50, 51

Hydriomena frigidata BARNES AND MCDUNNOUGH (*nec* Walker), 1914, Contributions to the natural history of the Lepidoptera of North America, vol. 2, no. 5, p. 204; 1917, *op. cit.*, vol. 4, no. 1, p. 17, pl. 3, fig. 12, pl. 8, fig. 5. SWETT, 1918, Ca-

nadian Ent., vol. 50, p. 294. BARNES AND BENJAMIN, 1928, Pan-Pacific Ent., vol. 4, p. 134. FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem., no. 274, pp. 140, 141 (*nec* figs. 151, 152).

Hydriomena frigidata race *manitoba* BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 17, pl. 3, figs. 13, 14. FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem., no. 274, p. 141.

Hydriomena manitoba, MCDUNNOUGH, 1951, Amer. Mus. Novitates, no. 1535, p. 8, fig. 4D (female genitalia).

The status of *manitoba* as a race of *transfigurata* has already been explained. Under this subspecific name, besides Manitoba material from Cartwright and Brandon, specimens from Livingston County, Michigan, central Illinois (Decatur, Urbana), New Brighton, Pennsylvania, and Horseheads, New York, have been examined and seem best placed here. In the Sperry collection are three dark males from Adamstown, Lancaster County, Pennsylvania, and in the Canadian National Collection two males from Sinking Springs, Berks County, in the same state. Such specimens are, in part, very similar to typical *transfigurata* in coloration and maculation. In general, however, the appearance is much darker, with less of the pale green shades evident. This is particularly the case with specimens from central Illinois as a reference to the figure in the 1917 revision (pl. 3, fig. 12) will show. On the other hand, the Horseheads specimens approach closest to the nimotypical race. Besides the figures in the revision, further ones were included in the 1951 paper so that, on the whole, little further discussion is necessary.

A figure is given here (fig. 50) of the salient portions of the male genitalia from a Brandon, Manitoba, specimen which shows the close similarity of the two races in this organ. The female organ has already been figured (1951) from a Horseheads, New York, specimen, the angle of observation being slightly different from that of the present figure (fig. 148) of the nimotypical race from a Barnstable specimen. The essential details are, however, quite similar.

TYPES: Holotype, male, and paratype, male, Cartwright, Manitoba (May 25 and 28), in United States National Museum.

DISTRIBUTION: Southern Manitoba, ex-

tending southeastward through Michigan and Illinois to eastern Pennsylvania and New York State.

REMARKS: This race appears to extend southward along the Atlantic coast states as far as northern Florida. A single female in the author's collection taken at Crailhope, Kentucky, shows the characteristic twisted genitalia. A worn male in the Franclemont collection labeled "U. S. Route 1 and St. Mary's River, Boulogne, Fla., April 1, 1936" also might be placed here.

Hydriomena bistriolata Zeller

Text figures 46, 47, 147

Cidaria bistriolata ZELLER, 1872, Verhändl. Zool. Bot. Gesell. Wien, vol. 22, p. 493.

Hydriomena californiata var. *bistriolata*, PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 95, pl. 8, fig. 32.

Hydriomena sordidata var. *bistriolata*, HULST, "1902" [1903], in Dyar, Bull. U. S. Natl. Mus., no. 52, p. 282 (err. det.).

Hydriomena bistriolata, BARNES AND McDUNNOUGH, 1914, Contributions to the natural history of the Lepidoptera of North America, vol. 2, no. 5, p. 204; 1917, *op. cit.*, vol. 4, no. 1, p. 28, pl. 5, fig. 3 (*partim*). SWETT, 1915, Canadian Ent., vol. 47, p. 58; *ibid.*, vol. 50, p. 295. FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem., no. 274, pp. 140-142. McDUNNOUGH, 1952, Amer. Mus. Novitates, no. 1592, p. 10, fig. 9 (holotype).

Hydriomena pluviata McDUNNOUGH (*nec* Guenee), 1951, Amer. Mus. Novitates, no. 1535, pp. 9, 12, fig. 4C (female genitalia).

Very little material of this species has been available for examination, and the correct association of the two sexes is still rather problematic. As already noted (1952) the holotype female, together with a slide of its genitalia, has been available for examination through the courtesy of the authorities of the British Museum. This type was figured in my 1952 paper, and a figure of its genitalia is now given (fig. 147). In the slide the bursa has unfortunately been bent backward but, if allowance is made for this, the close resemblance to the genitalia of *transfigurata* is obvious. A still closer resemblance is found to the genitalia of the specimen listed in my 1951 paper as the possible female of *pluviata* but which was considered later (1952) to fall, in all likelihood, under *bistriolata*.

The following notes on the type specimen

were made at the time of its examination. "Palpi fairly long but not longer than is found in certain female specimens of *transfigurata* and much shorter than those of *ruberata*. Front and lower part of collar pale greenish. Patagia anteriorly and thorax slightly green-shaded. Metathoracic tufts large, composed entirely of blackish scales. Maculation of primaries well indicated by the 1952 figure [fig. 9]; dark antemedian band and patch above tornus definitely brownish, not smoky, except along the inner margin of the former; pale areas suffused with green; no dark shade below discal spot as often occurs in *transfigurata*; subterminal band [band V] quite thin; the terminal area shows only minute dashes bordering the veins." The genitalia are disconcertingly close to those of *transfigurata*. In general it may be said that the ductus bursae is less bent to the right distally and that the partial septum is considerably less deep; more material is, however, needed to evaluate such characters as a means of specific separation.

As regards the male sex the 1917 revision notes that the specimen figured from Decatur, Illinois (pl. 5, fig. 3), agrees in the type of uncus with two topotypical male specimens in the Museum of Comparative Zoölogy, Harvard College, which might readily be considered as part of the type lot, according to Swett. This Decatur specimen is now, through the courtesy of the curator of the United States National Museum, before the author, and a slide has been made of its genitalia. A second male, similar in maculation and genitalia, has also been made available; this specimen was collected at Atlanta, Georgia, April 16, 1941, by F. W. Fattig. On the supposition that these two males are correctly identified as *bistriolata*, the following detailed description of their genitalia has been drawn up and the essential parts are illustrated (figs. 46, 47).

MALE GENITALIA: Uncus with short broad neck; forks very long, expanding apically, with their extreme apices rounded and little deflected, clothed ventrally with long setae; incision between forks very long and narrowly U-shaped. Tegumen narrow, without shoulder, the sides sloping gently outward from apex to base; inward chitinous projections narrow and pointed. Transtilla processes

thin and fairly long, with the usual apical hairs. Clasper short and broad, the ventral edge sinuate; costal edge chitinized, narrowing to a point at its junction with the valvula; costobasal tubercles present, tubercle I high and narrow, giving rise to a strong, sickle-shaped, chitinous ribbon; tubercle II obliquely placed, moderately large, with the usual large tuft of knobbed hairs and a distinct, thin, chitinous hair adjacent to tubercle I. Juxta plate high and narrow, the basal half fairly broad and with little of a stalked appearance; the sides are more or less parallel from base to median section, then bend rapidly outward and again become parallel in the apical section; apical projections moderate to strong, clothed with a cluster of long hairs, much more numerous than usual; marginal, thinly chitinized band narrow and improminent, confined to basal half of plate; vestiture of plate consisting of numerous long setae, giving a general hirsute appearance, considerably greater than usual. Anellus very finely spiculate. Aedeagus of normal length, rather broad, unarmed.

FEMALE GENITALIA: Very similar to those of *transfigurata*, showing the two twisted and distorted digitabula. As far as can be told from the meager material available, they differ in the greater length of the ductus bursae, the sides of which show less of a bend to the right in the distal section; the septum appears to be considerably thinner and also less bent.

TYPE: Holotype, female, Dallas, Texas, in British Museum (Natural History), *ex* collection Zeller.

DISTRIBUTION: Northeastern Texas, Georgia (Atlanta), extending up the Mississippi Valley to Missouri (St. Louis) and Illinois (Decatur).

***Hydriomena pluviata pluviata* Guenée**

Plate 2, figures 14, 15; text figures 149, 150

Ypsipetes pluviata GUENÉE, 1857, Histoire naturelle des insectes, vol. 10, p. 378 (*partim*, male *nec* female). OBERTHÜR, 1920, Études de lépidoptérologie comparée, vol. 17, pl. 507, fig. 4238 (*nec* fig. 4237). MCDUNNOUGH, 1922, Ent. News, vol. 33, p. 229 (type fixation).

Hydriomena pluviata, BARNES AND BENJAMIN, 1928, Pan-Pacific Ent., vol. 4, p. 134 (synonymy). FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem.,

no. 274, p. 142 (*partim*), fig. 152 (? as *frigidata*). MCDUNNOUGH, 1951, Amer. Mus. Novitates, no. 1535, pp. 8–13, fig. 1N (holotype), fig. 5A, B (*nec* fig. 4C).

Hydriomena transfigurata SWETT, 1912, Canadian Ent., vol. 44, p. 195 (*partim*, female *nec* male); 1912, *ibid.*, vol. 44, p. 228; 1918, *ibid.*, vol. 50, p. 294. BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 17, pl. 3, fig. 15 (paratype). MCDUNNOUGH, 1951, Amer. Mus. Novitates, no. 1535, pp. 8, 10, 12 (allotype and paratype discussed).

This species has been fairly adequately discussed in my 1951 paper where a figure of the lectoholotype male and portions of its genitalia were given; little further, therefore, can be added to the statements contained in that article. It is unfortunate that no definite type locality was given by Guenée, but it can be surmised that the specimen may have been captured in northern New York State or Massachusetts. A certain degree of corroboration for this suggestion is found in the fact that two other specimens placed by Guenée in his type series have been found to belong to *perfracta* and *renunciata*, respectively. Both these species are distinctly Canadian zone members and are not known to occur in the east farther south than the Catskill Mountains. It seems fairly logical to suppose that the type specimen was taken with these, and all three may have been indeed part of the material collected in northern New York State by Doubleday, who is known to have given Guenée a considerable number of these specimens. The greenish suffusion of the primaries in the type is a further point in favor of its northern origin, as specimens from farther south (Lakehurst, New Jersey) show a diminution of the green shading, especially in the females. Farther south again (Kentucky, Georgia) the species becomes much darker in appearance and seems to be worthy of subspecific status, which is discussed below.

Apart from the two females already mentioned as having been captured at Barnstable, Massachusetts, with the true *transfigurata*, no further specimens from this area have been noted. One of these is figured. The so-called paratype of *transfigurata* from Cohasset, Massachusetts, figured in the 1917 revision (pl. 3, fig. 15) may be considered as fairly

typical of the species, although somewhat less maculate. Two male specimens from Mystic, Connecticut, April 28, 1925, from the American Museum of Natural History appear to be quite typical, one of the specimens from which a genitalic slide was made showing the laterobasal tubercles on the uncus and the distinctive type of juxta plate. The allotype of *transfigurata* also belongs here on the basis of the genitalia; a figure of this specimen is given (pl. 2, fig. 14). One of the Barnstable females, the genitalia of which have served for the illustration given of this organ (fig. 149), is also figured (pl. 2, fig. 15).

As regards the occurrence of the species in the New Jersey pine barrens at Lakehurst, considerable material was formerly collected by the late F. Lemmer in April and early May together with *transfigurata*, as has already been mentioned. A male from this locality, with a portion of its genitalia, was figured in 1951 (figs. 1J, 4C). These New Jersey specimens are on the whole somewhat more suffused with smoky sprinkling, and the green shades of the basal and postmedian areas are more of an olive-green than of the light green shade noted in the few Massachusetts specimens available for study; the black cross lines are at times very heavy. In the male genitalia a decided tendency has been noted for the basolateral tubercles of the uncus to disappear almost entirely. In such cases the broader neck and the practically parallel sides from base to tip still serve to separate the species from *transfigurata*. A better character, however, is found in the different juxta plate which appears quite constant in shape and quite distinct. The female genitalia do not differ from those of Massachusetts specimens. A figure of the organ from a specimen in the Canadian National Collection is given (fig. 150). This agrees, after comparison, with the genitalia of the misdetermined allotype of *transfigurata*. The position differs from that of the Barnstable specimen, being left lateral, whereas the other drawing shows a ventrodorsal aspect. It is possible that the Lakehurst specimens may prove to have good subspecific status, but at the present time it would seem rather rash to propose a racial name in view of the fact that there is still a considerable element of doubt as regards Guenée's type locality.

Until good series of specimens are available from more northern localities, it does no harm to leave the matter in abeyance.

MALE GENITALIA: (Based on a Lakehurst, New Jersey, specimen). Uncus neck rather short and broad, the sides practically parallel from base to apex; excavation between the forks moderate, narrowly V-shaped; small lateral protuberances occur at the base (at times obsolescent) and when present are a characteristic feature. Tegumen rapidly broadening from base to apex; little trace of a shoulder; inward chitinous projections near base large, triangular. Finger-like processes from transtilla rather short, otherwise as usual. Clasper short and broad, with a fairly evident median incurve of the ventral edge; costobasal tubercles normal; tubercle I giving rise to a broad, rather short, sickle-shaped, chitinous ribbon; tubercle II with the usual tuft of knobbed hairs and with a fine chitinized hair adjacent to tubercle I, a distinctive feature. Juxta plate high and narrow, with sinuate lateral edges and a broad, scarcely stalked base; apical projections strong, their inner edges continued downward, curving inward and almost joining in the median area; the usual apical tufts of long hairs present; balance of plate, except median section, clothed sparsely with fine hairs; the lightly chitinized marginal bands narrow; space between base and edge of sacculus very narrow. Anellus very finely spiculate. Aedeagus long, thin, unarmed.

FEMALE GENITALIA: (Based largely on a Barnstable specimen). Very distinctive. The lobes of the ovipositor shorter, broader, and more heavily chitinized than is usually found in the group, where little variation occurs in the numerous species. Ostium membranous and very broad; neck short, membranous; chitinous collar somewhat twisted. Ductus bursae very short and twisted, when viewed ventrally with rather deep lateral depressions. From both the dorsal and ventral distal edges of the ductus long, weakly chitinized bands descend along the bursa, terminating in two large digitabula; the ventral band reaches somewhat farther than the dorsal one, and the digitabula are situated in the median area of the bursa or even beyond it when poor inflation occurs. Membranous bursa attached, both dorsally and

ventrally, to the distal edges of the ductus, and pear shaped in appearance when fully inflated.

TYPE: Holotype, male, "Amerique septentrionale," in United States National Museum, *ex* collections Oberthür and Barnes.

DISTRIBUTION: Occurs in the coastal regions of Massachusetts (Cohasset, Barnstable) and Connecticut (Mystic), and in a slightly variant form in the pine barrens of New Jersey (Lakehurst).

***Hydriomena pluviata meridianata*,
new subspecies**

Plate 2, figure 16; text figures 52, 53, 151

This subspecific name is proposed for the darker race, already mentioned, which occurs in the southern United States and in which the light green shades of the typical form are lacking or are replaced by a faint olivaceous tinge. The basal space is the palest area on the primaries, being slightly suffused with a pale olivaceous and with comparatively little smoky shading; it is outwardly bounded by a black line (line I) which is slightly convex and directed outward as is characteristic for the species. The antemedian area is very dark, almost black, and in consequence band II is much obscured; a black shade occurs along the inner margin. The pale postmedian area is considerably sprinkled with smoky and much contracted above inner margin; it contains a small discal dot and is very slightly shaded with pale olivaceous. The subterminal and terminal areas are variably suffused with smoky sprinkling, somewhat obscuring band V, which, however, is bordered generally with a paler, dull olivaceous shade. The terminal marginal line and dashes on both sides of the veins are strong. Fringes light smoky, checkered with black. Secondaries deep smoky. Beneath smoky, secondaries with faint curved postmedian and subterminal lines. Expanse, wing tip to wing tip, 25–29 mm. The holotype is figured.

The genitalia of a topotypical specimen, which are figured (figs. 52, 53), show the characteristic lateral tubercles at the base of the uncus. Other specimens from the same locality are without these or with only a faint trace of them. All specimens examined show the same type of juxta plate. The figure of

the female genitalia given (fig. 151) is from a specimen in the United States National Museum from Atlanta, Georgia; a right lateral view is shown, with a strongly inflated bursa; in the drawing the apparent differences in the details of the ductus bursae are due to the different position of the object on the slide.

HOLOTYPE: Male, Crailhope, Green County, Kentucky, March 29, 1949 (Carl Cook), in the American Museum of Natural History.

ALLOTYPE: Female, Atlanta, Georgia (Fatig), in United States National Museum.

PARATYPES: Seven males, same data as holotype, March 28, 29, 1949, March 14, 29, 1952, in author's collection for the present; three males, one female, Clemson, South Carolina, March 25, 27, 29 (W. Mason), in the Canadian National Collection; one male, one female, same data as allotype, in United States National Museum; one female, Clarke County, Georgia, April 6, 1929 (Richards), in the American Museum of Natural History.

A very worn male from near Myrtle Beach, Horry County, South Carolina, April 10, has been examined but is not included in the type series.

Since the above description was written a series of seven males and three females, taken by J. G. Franclemont at Arlington, Virginia, during the last week of March and the first two weeks of April in 1949 and 1950, have been received for determination. These specimens also belong to the above subspecies.

REMARKS: It might be well to note that Lakehurst, New Jersey, specimens are somewhat intermediate between the pale green-shaded northern form and the present subspecies. In general they lack the deep smoky antemedian band, this area being considerably suffused with rather deep olivaceous, as is noted above under the nymotypical heading.

***Hydriomena obliquilinea* Barnes and
McDunnough**

Text figures 54, 55, 152

Hydriomena obliquilinea BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 21, pl. 3, fig. 11 (lectoholotype).

Apart from the type material, no other specimens of this apparently rare species have been examined. The name was based on a fe-

male from Vineyard, Utah, in the Barnes collection and a male from Stockton, Utah, in the American Museum of Natural History. As stated, the description was drawn up from the female which was also figured, and it seems logical to make this the lectoholotype. According to the genitalia of the holotype which are figured (fig. 152) the species must be closely allied to *pluviata*, and in fact no definite specific characters to distinguish the organ in the two species have been noted. In the male allotype, which certainly appears to be correctly associated, there are better specific differences, notably in the basal portion of the uncus which broadens very considerably below the forks. The juxta plate, too, is narrower, and the sides are evenly inwardly oblique from apex to base and lack the median incurves of *pluviata*. Figures of these parts are given (figs. 54, 55).

The light gray coloration of the primaries and the rigidly oblique subbasal line (line I) are quite characteristic. The palpi are also noticeably shorter than those of *pluviata meridiana*. The time of flight (September–October) is unusual and, as hinted at in the original description, may indicate a second generation. More material is very essential before the definite status of the species can be established.

MALE GENITALIA: (Based on the allotype). Uncus broad, bulging laterally with a slight constriction at the extreme base; forks short, closely approximate, and separated by a V-shaped incision; apices pointed and directed slightly inward. Tegumen without shoulder; chitinized inward projections near base moderate in size, triangular. Finger-like processes from transtilla rather short, with the usual apical setae. Clasper rather thin, ventral edge slightly sinuate; the costobasal tubercles large, broadly rounded at apices; sickle-shaped chitinous ribbon from tubercle I rather thin; tubercle II with the usual tuft of knobbed hairs and a thin chitinized hair adjacent to tubercle I. Juxta plate narrow, the sides evenly inwardly oblique to the broad, scarcely stalked base; apical projections strong, with the usual tufts of long hairs; squamation of plate composed of fine scattered setae; thinly chitinized marginal band well developed; rounded basal projection faintly spiculate; space between base of plate

and sacculus edge very narrow. Anellus very finely spiculate. Aedeagus normal; no armature in the vesica.

FEMALE GENITALIA: (Based on holotype). Very similar to those of *pluviata*. Ductus bursae well chitinized, extremely short; partial septum strong, varying in appearance according to position of object on slide. Two digitabula situated medially on the ventral and dorsal sides of the membranous bursa and connected with the ductus by long, thinly chitinized bands; the ventral digitabulum situated farther distad than the dorsal one. Bursa in holotype poorly inflated and shriveled, but presumably oval in shape. The drawing shows a left lateral view.

TYPES: Holotype, female, Vineyard, Utah, September 1, in the United States National Museum; allotype, male, Stockton, Utah, October 12, in the American Museum of Natural History.

DISTRIBUTION: So far known only from the vicinity of Utah Lake.

Hydriomena rita, new species

Plate 3, figure 14; text figures 56, 57

Size small, wing expanse from tip to tip of primaries 22 mm. Somewhat reminiscent in general coloration of *sierrae* or *exasperata* but differing in genitalia. Palpi moderately long, projecting well beyond front, well tufted dorsally, smoky in coloration. Male antennae rather thin, laterally compressed, ventral edge showing little trace of serration. Head and collar largely whitish. Thoracic squamation rubbed, indeterminable. Basal and postmedian areas of primaries pale, whitish, with some sprinkling of smoky dots and a faint pinkish shade; antemedian band dark brown, very prominent, tinged with ruddy coloration; subterminal and terminal areas strongly suffused with darker shades. At extreme base of wing an obscure smoky patch. Line I black, slightly bowed outward from costa to vein 1, then strongly oblique and somewhat thickened to inner margin, forming the inner edge of the dark antemedian area. Band II much obscured by the dark coloration of the entire area, purplish, irregularly dentate and more or less parallel to line I. Line III forming outer edge of dark antemedian area, parallel to previous lines, slightly crenulate, especially above inner margin

where it terminates in a black shade extending backward to band II. The pale postmedian area much broader at costa than at inner margin and broadening still further between veins 2 and 4; it contains a fine dark discal streak, largely obscured by smoky sprinkling. Line IV forming outer edge of pale postmedian area, black, oblique outwardly and slightly dentate from costa to vein 4, then narrower and forming two outward rounded bulges, the lower of which bends sharply inward to vein 2, the line then thickening and running more or less upright and slightly dentate to inner margin. Band V broad, purple-black, narrowing considerably in its median section, defined on both sides by mixed olivaceous and ruddy shading. A black apical spot, followed by the usual two black transverse streaks, the lower one of which crosses band V. A fine black terminal line, accentuated in median section by several black spots. Fringes dusky, slightly checkered. Secondaries rather deep smoky brown, crossed by an obscure, angled, postmedian line and with a very faint discal dot. Under side somewhat paler, with discal dot, postmedian line, and a narrow subterminal band fairly distinct.

MALE GENITALIA: (Based on paratype). Uncus with short, rather narrow neck with slight lateral bulges at extreme base. Forks quite strongly bowed outward, somewhat incurved and pointed at apex with broad, fairly deep, U-shaped incision between them, the whole uncus having much the appearance of a tuning fork. Tegumen almost triangular in appearance, the apical area quite narrow and the sides sloping strongly and almost evenly outward to base, with small lateral swellings shortly below apex; inward chitinous projections short, pointed. Transtilla processes thin and fairly long, with scattered apical setae. Clasper short and chunky, ventral edge somewhat sinuate; costobasal tubercles normal; tubercle I pointed dorsad and giving rise to a broad, twisted, chitinous ribbon, narrowing apically and terminating in a fine hook; tubercle II with the usual strong tuft of knobbed hairs and apparently no trace of any chitinous hair adjacent to tubercle I. Juxta plate high and narrow; base thin and noticeably stalked, the sides sloping evenly outward and terminating in fairly obvious apical projec-

tions from which the usual small tufts of long hairs arise; thinly chitinized marginal band continuous and quite broad in basal half of plate; vestiture of plate composed of fine scattered setae; space between base and edge of sacculus fairly broad. Anellus weakly spiculate. Aedeagus normal in length and width; vesica unarmed.

HOLOTYPE: Male, Madera Canyon, Santa Rita Mountains, southern Arizona, July 27, 1947 (L. Martin), in Los Angeles County Museum.

PARATYPE: Male, same locality and collector, July 17, in collection Sperry.

REMARKS: The position of the species cannot be accurately determined until the female sex can be examined. Its placement next to *arizonata* is quite temporary.

***Hydriomena arizonata* Barnes and McDunnough**

Text figures 58, 59

Hydriomena chiricahuata SWETT, 1909, Canadian Ent., vol. 41, p. 231 (*partim*); 1918, *ibid.*, vol. 50, p. 294.

Hydriomena arizonata BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 20, pl. 3, fig. 10 (holotype).

Apart from the three male specimens on which the name was based, no other material of this apparently rare species has been available for study; the female is still unknown.

Judging by the male genitalia, of which figures are given (figs. 58, 59) from a slide of the holotype made by H. W. Capps, the species appears to fall close to *pluviata* and *obliquilinea*, but until the female organ can be examined such an association is mere conjecture.

The palpi of the species are quite long. As noted in the original description, this character would almost place the species in the "long" palpi group. The male antennae are strongly compressed laterally, rather thick, and with no trace of serration on the ventral margin. The darker areas of the primaries show a distinctly brownish tinge rather than the almost black coloration found in *chiricahuata* which is practically identical in maculation. A pale spot in the subterminal area between veins 3 and 5 appears to be rather characteristic and does not occur in *chiricahuata* as far as is known. The secondaries are consid-

erably suffused with brownish, paling somewhat towards base.

MALE GENITALIA: (Based largely on a paratype in the Canadian National Collection from Palmerlee, Arizona). Uncus neck rather short and not very thick, the sides at the base gently swollen rather than tuberculate; forks bent slightly outward, moderate in length, the excavation between them narrowly U-shaped. Tegumen broadening rapidly, with little trace of a shoulder; inward chitinized projections near base broadly triangular. Finger-like processes from transtilla rather short, otherwise normal. Clasper short and chunky, the ventral margin decidedly sinuate; costobasal tubercles smallish, the chitinous ribbon from tubercle I of moderate width, strongly sickle shaped, tapering apically to a slightly hooked point; tubercle II with the normal tuft of knobbed hairs and a fine chitinized one adjacent to tubercle I. Juxta plate high and narrow, the lateral edges very slightly sinuate or with a faint median convexity as in the figure; base not appreciably stalked; apical projections well developed, with the usual tufts of long hairs; outer, weakly chitinized band quite narrow and not very obvious; squamation of plate composed of fine, short, sparsely placed setae; width between base and margin of sacculus narrow. Anellus very finely spiculate. Aedeagus thin and rather long; no armature of the vesica.

FEMALE GENITALIA: Unknown.

TYPES: Holotype, male, Palmerlee, Arizona, in the United States National Museum, *ex* collection Barnes. Paratype, male, same data, in Canadian National Collection; another paratype, presumably from Huachuca Mountains, Arizona, in the United States National Museum.

DISTRIBUTION: Known only from the region of the Huachuca Mountains, Arizona.

***Hydriomena albimontanata* McDunnough**

Plate 3, figure 2; text figures 60, 61, 153

Hydriomena albimontanata McDUNNOUGH, 1939, Canadian Ent., vol. 71, p. 249 (as *albimontana*, *typ. err.*); 1952, Amer. Mus. Novitates, no. 1592, p. 9.

The species is one of those numerous ones occurring in the higher mountainous regions of western America in which the general coloration of the forewing is a dull gray, crossed

by blackish lines and smoky brown bands. The type series was collected by G. and J. Sperry in 1935 and simply bore the locality label "White Mts., Ariz." One of the paratypes in the Los Angeles County Museum, probably collected at the same time and place by Dr. J. Comstock mentions the elevation as 9000 feet, and another specimen in the same collection has the additional information "McNary Road." Apart from these specimens, all collected in 1935, no further Arizona captures have been recorded. However, in the original description a male from Banff, Alberta, is mentioned as probably belonging here. Several female specimens received from the Calgary laboratory of the Canadian Forest Insect Survey, bred from larvae collected at Hotchkiss, Alberta, in the Peace River area on spruce, and Coleman, Alberta, in the Crow's Nest Pass on Douglas fir, have been identified as this species by genitalic characters. A fair series containing both sexes was bred by the Vernon Forest Insect Laboratory from larvae collected on Douglas fir (*Pseudotsuga taxifolia*) in southeastern British Columbia (Fort Steele, Canal Flats) and in the region of the upper Fraser Valley (Clinton, Jesmond). All these specimens are smaller and darker than typical Arizona *albimontanata*, but as this in all likelihood is due to altered conditions during breeding, it is not considered advisable to base a subspecies on such material. A single female in the American Museum of Natural History collected at Estes Park, Colorado, June 11, 1913, has also been examined. The species would appear to occur all through the Rocky Mountain region from Canada to Arizona, but as yet the Colorado specimen forms the only connecting link between the two extremes.

From similarly colored and maculate species *albimontanata* can at once be distinguished by its very short stubby palpi which barely exceed the front; such a character is found only in *expurgata*, the maculation and genitalia of which are distinctive enough to obviate any confusion. In the small series examined (four males, three females) the strongly defined maculation is very constant, and little can be added to the characters given in the original description. It might be noted that the thin male antennae are only slightly thicker than those of the female and show lit-

tle or no trace of ventral serration. As far as can be told from the rather rubbed condition, the vestiture of the front and thorax consists of an admixture of pale and dark scaling, the latter predominating at the bases of the patagia; the metathoracic tuft has unfortunately been rubbed off.

MALE GENITALIA: Uncus with moderately broad neck, the length about equal to that of the forked portion. Forks long, quite broad, closely approached, the excavation between them long and narrow; apices rounded, not bent inward and pointed; their lateral edges continue the line of the basal portion; a number of long scattered hairs arise from the ventral side. Tegumen with distinct shoulder at apex, broadening rapidly and rather short; inward chitinous projections thin, triangular, pointed. Transtilla with finger-like processes long and thin, and furnished with the usual apical hairs. Clasper normal, ventral edge only feebly incurved at middle; tubercle I truncate apically, giving rise to a strong, chitinous, sickle-shaped ribbon, pointed apically; tubercle II moderate, with the usual strong tuft of recurved knobbed hairs; no thin chitinous band adjacent to tubercle I can be observed. Juxta plate broad apically, the projections widely separated but little produced and rounded rather than pointed; lateral edges slightly sinuate and directed obliquely inward to a rather broad and only weakly stalked base; a broad, thinly chitinized, marginal band extends upward from the base for three-fourths of the length of the plate. Basal rounded section connecting the two edges improminent; space between plate and edge of sacculus very narrow. Tufts of long hair arise from the apices, and sparsely scattered setae cover the remaining lateral areas of the plate. Anellus finely spiculate. Aedeagus normal; vesica without armature.

FEMALE GENITALIA: Ostium normal, membranous. Neck short, membranous, with the usual terminal half collar, open dorsally. Chitinized ductus bursae long, the sides slightly irregular but in general parallel. On the ventral side the chitinization of the left half of the ductus extends much farther cephalad than that of the right side and terminates in a large rounded digitabulum situated medio-ventrally on the membranous bursa, a very characteristic feature. The inner septum is

weak and terminates in a line with the right edge of the ductus bursae. The bursa is pear shaped and entirely membranous, the dorsal attachment to the ductus being situated only slightly proximad of the termination of the chitinization of its right side.

TYPES: Holotype, male, and allotype, female, White Mountains, Arizona, June 15 and 20, 1935, in Canadian National Collection. Paratypes in Sperry collection and the Los Angeles County Museum.

DISTRIBUTION: Eastern Arizona, extending northward through the Rocky Mountains to Alberta and southeast and central British Columbia.

LARVAL FOOD PLANTS: Douglas fir (*Pseudotsuga*) and spruce (*Picea*).

Hydriomena sierrae Barnes and McDunnough

Text figures 62-65, 154-156

Hydriomena sierrae BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 23, pl. 4, figs. 4, 5, pl. 8, fig. 8 (genitalia).

This species and *nevadae* are very closely related, and there is considerable difficulty in separating the two species on maculation alone, especially as it has been found that they occur together in many localities. The best character for separation is found in line III which forms the outer margin of the darker antemedian band. In *sierrae* this line is almost rigidly outwardly oblique, showing only the faintest of crenulations; in *nevadae*, on the other hand, the line is distinctly wavy and generally shows a quite obvious invagination immediately above the anal vein. In both species the male antennae are quite thick and without any serration on the ventral edges.

In the original descriptions stress was laid on the difference of palpal length, the palpi of *sierrae* being referred to as "moderate" palpi while those of *nevadae* were classed as "long." This difference is in most instances a quite useful means of separation, but a certain amount of caution must be used in applying it as it has been noted that in the females of *sierrae*, which show in any case slightly longer palpi than the males, certain specimens tend to approach the males of *nevadae* in palpal length and, *vice versa*, some females of *nevadae* show shorter palpi than usual.

In the male genitalia the difference in the

uncus of *sierrae* from that of *nevadae* is quite obvious, the neck being long and thin and the forks short and closely approached; as usual the depth of the excavation between the forks is rather variable, but the apices of the forks are pointed and turned slightly inward, whereas in *nevadae* the terminal edges of the much broader and longer forks are rounded. In the vesica, as far as can be determined from the rather limited material available, there is no armature, while *nevadae* shows a faint cluster of weak cornuti. The female genitalia of the two species agree in that both show a large digitabulum on the upper right side of the bursa instead of the usual position on the left side. The chitinized ducti bursae are rather variable in length and in amount of distal curvature to the right. One of the best distinctive characters is found in the ovipositor lobes and their posterior apophyses. While they appear fairly normal in *nevadae*, the lobes in *sierrae* are very thinly chitinized, rather broad, and separated by a very short incision; the apophyses are thin and extremely long, and in fact the entire terminal segments are much more drawn out in *sierrae* than in *nevadae*.

MALE GENITALIA: (Based on the holotype). Uncus with the neck fairly long and thin; apical forks short, thin, and little expanded laterally, the V-shaped incision between them very narrow. Tegumen with slight indication of shoulder; inward chitinous projections near base weak and narrowly triangular. Finger-like processes from transtilla rather long for the size of the organ, thin, and with the usual scattered apical setae. Clasper short and broad, ventral margin gently sinuate; costobasal tubercle I small, giving rise to a slender, sickle-shaped, chitinous ribbon; tubercle II much larger, broadly rounded, with the usual tuft of knobbed hairs but with no trace of a thin chitinized hair adjacent to tubercle I, an apparent distinction from *nevadae*. Juxta plate weak, high, and narrow (in paratypes apically somewhat broader), lateral edges slightly convex (at times rigidly oblique) and directed obliquely inward to a very narrow stalked base; apical projections weak, with weak tufts of long thin hairs; thinly chitinized marginal band quite prominent in basal half of plate; squamation of plate consisting of fine scattered setae. Rounded

section at base very finely spiculate; space between base and margin of sacculus very narrow. Anellus very finely spiculate. Aedeagus thin, without armature in vesica.

FEMALE GENITALIA: (Based partially on the allotype). Ostium, short, membranous neck, and collar normal. Ductus bursae well chitinized, quite variable in breadth and length; in the allotype rather broad, upright, the septum weak, curving distally to the right and terminating in a large digitabulum; in a specimen from Gold Lake, Sierra County, narrower, the septum stronger and more noticeably curved to the right; in a paratype from Cisco, Placer County, much shorter, somewhat irregular, the strong septum sharply bent to the right and terminating in a knob-like digitabulum. As these three all show the characteristic feature, already mentioned, of weakly chitinized ovipositor lobes and extremely long posterior apophyses, it is presumed that the differences are individual rather than specific. Figures of these organs are given (figs. 154-156).

TYPES: Holotype, male, and allotype, female, Shasta Retreat, Siskiyou County, California, June 24-30, in United States National Museum, *ex* collection Barnes. Paratypes from Cisco, Placer County, California, in United States National Museum, the American Museum of Natural History, and the Canadian National Collection.

DISTRIBUTION: Known from various California localities in the northern Sierras, Siskiyou County (Shasta Retreat); Plumas County (Smith Lake, Mohawk); Sierra County (Gold Lake); Nevada County (Lake Independence); Placer County (Cisco). While in these regions it occurs with *nevadae*, it has not as yet been found in the more southerly counties where *nevadae* is quite abundant. A single male in the Canadian National Collection from the vicinity of Keremeos, British Columbia, taken with *nevadae*, seems on genitalic characters to belong here. It is a very fresh, brightly colored specimen with considerable ruddy shading on the primaries; it shows the same character in line III that is mentioned above as being diagnostic.

Hydriomena nevadae Barnes and McDunnough

Text figures 66, 67, 157

Hydriomena similis HULST (*nec* Hulst), 1896,

Trans. Amer. Ent. Soc., vol. 23, p. 284 (*partim*). BARNES AND MCDUNNOUGH, 1916, Contributions to the natural history of the Lepidoptera of North America, vol. 3, no. 3, p. 176.

Hydriomena ruberata nevadae BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 30, pl. 5, figs. 6, 9, pl. 9, fig. 7.

Hydriomena nevadae, MCDUNNOUGH, 1944, Canadian Ent., vol. 76, p. 210, pl. 13, fig. 3 (female genitalia of paratype).

The resemblances and differences between this species and *sierrae* have already been discussed, and little further can be added to what has already been said.

The species appears to be more common than *sierrae* and its range more extended, for, while it occurs in the same localities in the northern Sierras, it has also been collected in considerable numbers in counties as far south as San Bernardino. From the dated material available it would seem to make its first appearance rather earlier in the season than *sierrae*, approximately in the middle of June, while *sierrae* scarcely appears before the last days of this month and usually not until early July. In size it is generally slightly larger than *sierrae*, and this is especially noticeable in southern specimens (upper Santa Ana River, San Bernardino County) in which also the longer palpi form a good character for separation.

In the genitalia the male organ shows much better characters for differentiation than does the female one, as a reference to the detailed description and the illustrations will show. In the female the anal lobes of the ovipositor and the posterior apophyses are the most characteristic features as far as a separation from *sierrae* is concerned. The lobes are similar to those of most of the other species in the genus, being narrow, pointed apically, and fairly well chitinized; the posterior apophyses are also normal, being shorter and much stouter than those of *sierrae*. In the ductus bursae and bursa no definite character for separation of the two species has been found, and a very similar range of variation occurs in both. A figure of the organ from a paratype in the Canadian National Collection has already been given (1944), and the present figure is based on a specimen from the Greenhorn Mountains, Kern County, California.

MALE GENITALIA: (Based on a specimen

from Mohawk, Plumas County, California, that agrees very closely with a paratype from Verdi, Nevada, in the Canadian National Collection). Uncus with the neck short, rather thin; forks broad and long, very close together, with a long V-shaped excavation between them; apices of lobes rounded and little depressed, ventrally with a few scattered long hairs. Tegumen with fairly evident shoulder, broadening narrowly from this point to base; inward chitinous projections moderate in size, triangular. Finger-like processes from transtilla rather short and thin. Clasper short and broad as usual, with ventral edge somewhat sinuate; costobasal tubercles much as usual, tubercle I being fairly large and tubercle II rather reduced in size; the well-chitinized, sickle-shaped ribbon from tubercle I rather thin and short; the usual tuft of knobbed hairs from tubercle II and a fine chitinized hair adjacent to tubercle I, differing in this respect from *sierrae*. Juxta plate high and narrow, lateral edges almost rigidly inwardly oblique, slightly convex at apex and still less so medially; base moderately broad, slightly but not very noticeably stalked; apical projections very weak and the long hairs, usually present in this section, very thin, scattered, and scarcely visible; squamation of balance of plate composed of fine scattered setae, more numerous at base; thinly chitinized marginal band obsolescent, occasionally narrowly present in basal third but not so well developed as in *sierrae*; space between base and margin of sacculus broader than in *sierrae*. Anellus with rather strong spiculation. Aedeagus longer and stouter than in *sierrae*; vesica with a very faint cluster of weak cornuti, at times almost impossible to see.

FEMALE GENITALIA: (Based largely on a specimen from Greenhorn Mountains, Kern County). Terminal abdominal segments, ovipositor lobes, and posterior apophyses normal, constituting a good differential character from *sierrae*. The genitalia proper show no essential differences from those of *sierrae*, having a strong septum in the ductus bursae, bending distally to the right, and terminating in a large digitabulum. Similar individual variations occur as illustrated for *sierrae*.

TYPES: Holotype, male, and allotype, female, Verdi, Nevada, June, in United States

National Museum, *ex* collection Barnes; paratypes in the American Museum of Natural History and the Canadian National Collection.

DISTRIBUTION: Occurs throughout the California Sierras and extends southward into the San Bernardino Mountains where it was captured in numbers on the upper Santa Ana River by G. and J. Sperry; there is also a good series in the Los Angeles County Museum collected in the Greenhorn Mountains, Kern County. A small series in the Canadian National Collection from the vicinity of Keremeos, British Columbia, is the only known Canadian record, and a single male from Baker, Oregon, in the Sperry collection (*ex* collection Guedet as *muscata*!) is the one record known from intermediate points. A very worn male in the Sperry collection from Beaver, Utah, July 14, 1938, appears to belong here according to genitalia.

Hydriomena californiata Packard

Text figures 68, 69, 158

Hydriomena californiata PACKARD, 1871, Proc. Boston Soc. Nat. Hist., vol. 13, p. 396.

Hydriomena californiata, PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 94, pl. 7, fig. 23 (*partim, nec* figs. 30, 32). SWETT, 1912, Canadian Ent., vol. 44, p. 229. BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 26, pl. 5, figs. 1, 2, pl. 10, fig. 2 (male genitalia). McDUNNOUGH, 1944, Canadian Ent., vol. 76, p. 210, pl. 13, fig. 4 (female genitalia).

The type specimen bears no label other than "California, Behrens" but it may be surmised that it was captured in the vicinity of San Francisco Bay where Behrens did a good deal of collecting. It probably is this specimen that served as the basis for figure 33 in Packard's monograph. Recently a good series of specimens has been taken by W. Bauer in mid July at Inverness, Marin County, and these may be considered as practically topotypical; the general coloration of primaries is considerably darker than that of the very few other California specimens available for examination and especially Vancouver Island specimens where the species, as has been already noted, occurs apparently much more commonly than in California. The genitalia, however, of both forms are identical, and as con-

siderable color variation has been noted in the Vancouver Island series in the Canadian National Collection, it seems scarcely wise to propose, at the present time, a subspecific name for these.

Californiata shows a certain amount of similarity to *irata* owing to the frequent occurrence of ruddy shades in the basal and postmedian areas. Apart from its considerably longer palpi and more pointed wing shape in the males, the best character of the maculation is found in the subbasal line (line 1) which, while quite oblique, lacks the strong outward angulation below the costa found in *irata*.

As regards outer structural characters, the palpi, although placed in the "moderate" palpi group in the 1917 revision, could almost as well be called "long," especially in certain females; apparent variation in length is frequently due to the position of the palpi at the time of death. In cases where they are closely appressed to the front, which is really the proper position, they appear shorter and more upturned than when more porrectly extended and thus removed from close connection with the front. The male antennae are quite thick and show a distinct serration of the ventral edge, virtually as much as occurs in *irata*. In the genitalia of the males the deep incision between the forks of the uncus would appear to ally the species to *renunciata*, *modestata*, and several other species. On the other hand, in the female the position of the digitabulum on the right side of the bursa instead of on the more usual left side points to an association with *nevadae*. Several other such cases, where the male genitalia point in one direction and the female genitalia in another, occur in the group. A notable case is that of *renunciata* where the males show the same deep incision between the lobes as in the present species, while the female organ is definitely allied to that of *frigidata*, a species with short uncus forks in the male.

The male genitalia were figured *in toto* in the 1917 revision (pl. 10, fig. 2), and the female organ was shown in the 1944 paper, both figures based on Vancouver Island specimens. The present illustrations are from specimens collected at Inverness, Marin County. The presence of a weak cluster of cornuti in the vesica is characteristic.

MALE GENITALIA: Uncus neck very short

and thick; forks long and broad, their sides somewhat convex and apices rounded and only slightly depressed; incision between them narrowly U-shaped; ventrally the apical half of the forks is quite heavily covered with long hairs. Tegumen with slight indication of a shoulder, broadening gently towards base; inward chitinous projections moderate in size, triangular. Finger-like processes from transtilla rather short and thin. Clasper normal, the costobasal tubercles rather small; the single chitinous ribbon from tubercle I quite thin but long and twisted; tubercle II with the usual large tuft of knobbed hairs and a very thin chitinized hair adjacent to tubercle I. Juxta plate high and narrow, the sides in the apical section almost perpendicular, then slightly sinuate and inwardly oblique to a moderately thick and short-stalked base (Vancouver Island specimens show a broader apical section and a better stalked base); apical projections weak, with the usual tufts of long hairs; the thinly chitinized, marginal bands very obvious in the basal two-thirds of the plate but narrowing beside the base; space between base and margin of sacculus quite broad; vestiture of plate consisting of fine, long, rather scattered setae. Anellus very finely spiculate. Aedeagus thin; vesica with obscure traces of a spine cluster, composed of weak scattered cornuti.

FEMALE GENITALIA: Ostium, membranous neck, and chitinous collar normal. Chitinized ductus bursae long, rather thin, the sides semiparallel, with, at times, a slight bulge on the left side. Partial septum quite short and weak, present only in the distal section of the ductus, thickest at the proximal end and directed obliquely to the right to join the distal end of the right side of the ductus where a large digitabulum occurs. Terminal edge of the chitinized ductus very oblique, directed downward from left to right. Dorsal attachment of the membranous bursa to the ductus at approximately the commencement of the septum.

TYPE: Holotype, male, California (Behrens), in Museum of Comparative Zoölogy, Harvard College.

DISTRIBUTION: Known only in California from Marin County, two males from Mendocino, Mendocino County, and single specimens from Klamath, Del Norte County, and Tioga Pass, Mono County. Occurs in the

Olympic Mountains, Washington (Rosemary Inn, Lake Crescent), and is quite common on southern Vancouver Island (Victoria) and adjacent areas on the British Columbian mainland (Grouse Mountain, Vancouver).

LARVAL FOOD PLANTS: A single male submitted by the Canadian Forest Insect Survey was bred from a larva on hemlock (*Tsuga*) on the Queen Charlotte Islands. Another very dwarfed male from Courtenay, Vancouver Island, was bred from a larva on Douglas fir (*Pseudotsuga*).

REMARKS: The specimen from Tioga Pass may represent a subspecies, but this can be determined only when more material is available for study. The two males from Mendocino sent by W. Bauer show a peculiar coloration, the primaries being rather evenly suffused with brown. Whether this character has subspecific value or not cannot be evaluated from such scanty material.

The following three names (*glaucata* Packard, *muscata* Barnes and McDunnough, and *crokeri* Swett with its subspecies *comstocki* McDunnough) refer to a group of very closely allied species, judging by genitalic characters. *Crokeri* can be definitely determined in both sexes as far as topotypical material goes. The same may be said for the male sex of *muscata* which, however, is known only by its type series of three quite distinctive-looking males from Sonoma County, California, and a few other topotypical males collected by W. Bauer. Until the female sex can be examined the exact relationship to the other species is doubtful. *Glaucata*, for a long time mis-determined, was based on a worn female from Santa Clara County, California. The correct identity was discussed by the author (1944) after a genitalic study, and a small series of specimens from the Santa Catalina and adjacent islands were referred to this name. It is probable, however, that these specimens are not altogether topotypical in maculation, although the females agree genitally. The nearest approach to topotypical material was found in a pair of specimens from Inverness, Marin County, sent for identification by W. Bauer; genitalic slides of these agreed excellently with the other slides of *glaucata*.

The female genitalia of *glaucata* and *crokeri* have already been figured (1944). They both show two centrally placed digitabula, the main differences between them consisting in

the greater length of the ductus in *glaucata* and the slightly different position of the digitabula. In the male genitalia all three species agree in possessing very long and weakly chitinized uncus forks, with a corresponding deep U-shaped incision between them. Owing to their fragile nature they are inclined to become a little twisted. Based on type or topotypical material the main differences among the three species are as follows: In *glaucata* (four slides examined) the uncus neck is very short and thick, and there is a slight indication of a shoulder in the tegumen. In *muscata* (three slides examined including type) the uncus neck is considerably thinner than in *glaucata* and somewhat longer; the tegumen shows a strong shoulder immediately below the base of the uncus. In *crokeri* (two topotypical slides examined) the uncus neck is intermediate in thickness between *glaucata* and *muscata*, showing, however, slight lateral bulges at base; the tegumen is without shoulder. These differences can be recognized in the illustrations given.

A few specimens, mostly males from isolated localities along the Pacific coast, have proved an almost insurmountable stumbling block to all attempts made to place them correctly in any one of the above three species. Besides being in rather poor condition, their coloration and maculation, as far as can be seen, are atypical, although their genitalia obviously show that they must belong in the present group. They may easily represent subspecies or possibly even good species, but the material is as yet far too limited to allow a decision on this point. As a present makeshift they have been classified, as far as possible, according to the genitalic differences mentioned above and are treated in more detail under the respective specific headings. It should be understood, however, that the determinations are largely tentative and, in fact, are mentioned only in order to stimulate collectors to secure longer and better series for further study.

Hydriomena crokeri crokeri Swett

Text figures 70, 71, 159

Hydriomena autumnalis var. *crokeri* SWETT, 1910, Canadian Ent., vol. 42, p. 278; 1912, *ibid.*, vol. 44, p. 227.

Hydriomena var. *crokeri*, BARNES AND McDUN-

NOUGH, 1912, Contributions to the natural history of the Lepidoptera of North America, vol. 1, no. 4, p. 45, pl. 21, fig. 10.

Hydriomena crokeri, BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 26, pl. 4, fig. 15, pl. 9, fig. 3 (male genitalia). McDUNNOUGH, 1944, Bull. Southern California Acad. Sci., vol. 43, pt. 1, p. 26, pl. 10, fig. 2 (female genitalia).

In its typical form from Vancouver Island the species is not difficult to recognize. The sharp angulation of the heavy, black, sub-basal line (line I) on the primaries has already been referred to as one of the characteristic features. With this, the prominence of the dark bands II and V in the light olivaceous antemedian and terminal areas and the dark suffusion in the former area along the inner margin are all helpful as means of recognizing the species; a slight comma-like black mark in the first incurve of line IV opposite the cell is generally present. The palpi are virtually similar in length to those of *californiata*, and the male antennae have the same thickness and the slightly serrate appearance of the ventral edge. The male genitalia show the same deep incision between the forks of the uncus as is found in *californiata*, but the forks themselves are thinner, and the short neck is not so broad but shows a slight swelling of its lateral edges at the extreme base. These characters are shown in figure 70, based on a topotypical specimen in the Canadian National Collection from Victoria, British Columbia. The female genitalia with their two medioventral digitabula have already been illustrated (1944) from a topotypical specimen and are again reproduced from the same slide (fig. 159).

The species has an early seasonal flight, the specimens examined having all been captured in late April and early May.

Apart from the Vancouver Island specimens, very little material of the topotypical form has been available for study. There is a quite typical male in the Sperry collection from Tenino, Washington, April 23, 1949. The 1917 revision mentions a female from Salem, Oregon, and a female in the author's collection from McMinnville, April 11, 1940 (Fender), in the same state seems, according to genitalic characters, to belong here. The

latter has the same small wing expanse (29 mm.) as Vancouver Island specimens, but its maculation is not quite typical. The antemedian band is rather heavily suffused with blackish, standing out quite prominently, and the olivaceous shades are not so intense. Still its placement is fairly obvious. These are the only specimens examined that can be definitely placed as *crokeri*. A few other atypical male specimens from various localities in Oregon and California are mentioned below.

MALE GENITALIA: (Based on two Vancouver Island specimens in the Canadian National Collection). Uncus neck short and fairly broad, with slight lateral bulges at the extreme base; forks long and quite thick, expanding slightly apically, apices rounded and little depressed; incision between the forks deep and U-shaped; scattered long hairs on ventral surface of the apical half of forks. Tegumen without shoulder, expanding rapidly towards base but rather short; inwardly directed chitinous projections quite large and triangular. Finger-like processes from transstilla rather short and chunky. Clasper much as usual, with a rather deep incurve in the median section of the ventral edge; costobasal tubercle I large, the chitinous ribbon from its apex moderately broad, rather short and sickle shaped; tubercle II smaller than usual, very obliquely placed, with the usual tuft of long knobbed hairs but without any chitinized hair adjacent to tubercle I. Juxta plate high and narrow, the lateral edges almost perpendicular in the apical third, then sloping gradually inward to a rather broad base which is not noticeably stalked; apical projections moderately strong, their long hair tufts more obvious than in either *glaucata* or *muscata*; marginal, weakly chitinized band narrow but continuous; vestiture of plate consisting of fine, quite long, scattered setae; space between base and margin of sacculus very narrow. Anellus rather finely spiculate. Aedeagus slightly shorter and chunkier than that of *glaucata*; vesica unarmed.

FEMALE GENITALIA: (Based on a Vancouver Island specimen in the Canadian National Collection). Ostium and narrow short neck membranous as usual; chitinized half collar similar to that of other species; chitinized ductus bursae short and broad, considerably

shorter than in *glaucata*; sides virtually parallel. The ductus terminates in two large digitalia, placed slightly obliquely on the proximal section of the bursa; their dorsal edges are joined and project downward in a blunt spine, apparently rather shorter than in *glaucata*. Partial septum strong, terminating in the above-mentioned spine. Membranous bursa rather small and globular, its dorsal attachment to the ductus occurring slightly proximad of its median section.

TYPES: Holotype, male, Departure Bay, Vancouver Island, British Columbia, July 22, 1908, in Museum of Comparative Zoölogy, *ex* collection Swett. Cotypes are mentioned as being in the Croker and Taylor collections; the location of the former is unknown; the Taylor specimens were apparently unlabeled, as no record of them is given in the list of types purchased with this collection by Barnes (*vide* Canadian Ent., 1912, vol. 44, p. 270).

DISTRIBUTION: Known definitely only from southern Vancouver Island and the adjacent areas of Washington State. Apparently extends southward into central Oregon, judging by the single slightly atypical female mentioned above.

REMARKS: Two males from McMinnville, Oregon (one, much worn, in the Sperry collection taken April 12, 1934, the other, somewhat better preserved, in the author's collection, taken April 20, 1933), agree fairly well in maculation and coloration with each other; they also show on the primaries the angled subbasal line (line I) and the somewhat irregular line III which characterizes typical *crokeri*. They differ, however, in lacking the contrasted appearance of typical specimens, having more the general appearance of *californiata*, and also show no dark dash along the inner margin. Their genitalia differ and also differ from those of *crokeri*; both lack the basal swelling of the uncus neck and show a slight but quite definite shoulder to the tegumen. In the former specimen the forks of the uncus are quite similar to those of *crokeri*; in the latter the forks are extremely long and close together and appear weakly chitinized. Both specimens show a thin chitinized hair from tubercle II of the clasper, adjacent to tubercle I; this was not evident in *crokeri*. A very worn male from Medford,

Oregon, April 4, 1932, in the author's collection and two somewhat larger specimens, also worn, from Cherry Creek, west side of Klamath Lake, Oregon, elevation 4175 feet, June 28, 1937, may also belong here. All three lack the sharp angle of line I below costa, this line being greatly excurved; the general appearance is that of the McMinnville specimens. In the genitalia all show the small shoulder in the tegumen; there is considerable variation in the length of the uncus forks and the depth of the incision between them, but the Medford specimen and one of the Klamath Lake specimens show traces of the basal swellings of the uncus neck. A single male in the author's collection from McMinnville, Oregon, April 14, 1933, is very perplexing to place correctly. It has virtually the same genitalia as typical *crokeri* except that the uncus forks are longer and closer together, and that tubercle II of the clasper shows a fine chitinated hair adjacent to tubercle I. The coloration, too, is quite reminiscent of *crokeri*, but the size is much larger (33 mm. wing expanse), the subbasal line (line I) lacks the sharp outer angle and is merely excurved, and line III is quite regularly oblique and faintly and evenly crenulate. All the above-mentioned Oregon specimens may be merely forms or possibly subspecies of *crokeri*, but until more and better material of both sexes can be secured it would be folly to place them definitely.

Finally two worn males in the author's collection from Santa Cruz, California, March 28, 1932, and Atascadero, San Luis Obispo County, California, April 14, 1945, have the genitalia of *crokeri* but more the appearance of *californiata*; besides this the palpi appear quite short. In all probability a good subspecies of *crokeri* is indicated, but it would be hardly wise to base a name on such limited and poorly preserved material.

***Hydriomena crokeri comstocki* McDunnough**

Plate 2, figures 18, 19; text figures 72, 73, 160-162

Hydriomena glaucata BARNES AND McDUNNOUGH (*nec* Packard), 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 31, pl. 6, fig. 4.

Hydriomena crokeri var. *comstocki* McDUNNOUGH, 1944, Bull. Southern California Acad. Sci., vol. 43, pt. 1, p. 27, pl. 9, fig. B (paratype).

Hydriomena crokeri var. *comstocki* form *waltoni* McDUNNOUGH, 1944, Bull. Southern California Acad. Sci., p. 28, pl. 9, fig. C (paratype).

Virtually the entire type series of both *crokeri comstocki* and its form *waltoni* have been available for study, together with a considerable number of specimens from other localities. The type series of *comstocki* consists entirely of males which are very constant in their dark coloration and maculation. The figure given with the original description of a paratype is accurate, apart from a slightly rubbed space in the subterminal area of the right primary. As, however, the publication in which the description occurred may not be readily available for consultation, a figure of the holotype is presented (pl. 2, fig. 18). It might be well to call attention to a pale area in the subterminal space adjacent to the bulge in line IV; this was not mentioned in the original description but occurs in the whole type series. A figure of the adult holotype of *waltoni* is given (pl. 2, fig. 19), as it differs slightly from the figure published with the original article (pl. 9, fig. C). At first sight it presents a quite different appearance from the typical series of *comstocki* but genitally it is similar. It is strange that no females of the topotypical form were taken with the males, the few that occurred being of the *waltoni* form with considerable smoky suffusion obscuring the pale postmedian areas. So far only a single female has been found in the material examined that could be placed as *comstocki*. This specimen was taken at Meek's Bay, Lake Tahoe, July 3, 1941, by W. Bauer and is in the author's collection, and another female, taken at the same time, belongs to the form *waltoni*. The genitalia of the typical specimen (fig. 161) show a very short and broad ductus bursae; the ductus of form *waltoni* is somewhat longer and narrower and matches fairly closely that of the allotype of this form (fig. 160). These differences in the size of the ductus were noted and commented on (p. 29) in the original description and considered to be merely individual. After a further study of a number of slides of the female genital organ, the author still adheres to this opinion.

In the male sex the same diversity of genitalia as in the females is evident. The holotypes of both *comstocki* and the form *waltoni*

show the small bulges at the base of the uncus neck which is characteristic of the nymotypical *crokeri*. A figure of these parts in the holotype of *comstocki* is given (fig. 72). In other specimens of the type series this bulge is not present or is vestigial. The length of the uncus forks and the corresponding excavation between them are also variable; the length of the neck varies, in consequence, quite considerably. Occasionally a distinct shoulder occurs in the tegumen, although scarcely as prominent as in *muscata*. At times a fine chitinized hair from the costobasal tubercle II of the clasper, adjacent to tubercle I, can be observed; the finger-like processes from the transtilla are, as it happens, rather short in the holotype of *comstocki* but in general are long and thin. Some differences also occur in the width of the base of the juxta plate and in the contour of the lateral edges. This variability is greater than usually occurs in other species but, as far as the author is able to judge, must be ascribed to individual variation. Nothing in coloration or maculation of the primaries is apparent which would justify either racial or specific separation.

In the Canadian National Collection two specimens which are virtually typical *comstocki* have been examined. These specimens were taken at Cherry Creek, west side of Klamath Lake, Oregon, and bear exactly the same labels as do the two specimens commented on under *crokeri* but not definitely placed. Certainly the appearance of these two groups is quite distinct, and it might lead to the surmise that some species other than *crokeri* is involved, or that *comstocki* may eventually prove to have specific rank. Neither suggestion can be proved at the present time. In a good series of specimens from the Sperry collection taken on the upper Santa Ana River in the San Bernardino Mountains at about 6000 feet altitude only one male was of the typical form, the others being close to the form *waltoni*. In the male genitalia the uncus forks are extremely long; one specimen shows the lateral bulges at the base of the neck, others are without this. In the female organ the usual variability in the length of the ductus occurs; one specimen in which the ductus is unusually long is illustrated (fig. 162).

Types: Holotype, male, Yosemite National

Park, California, May 19, 1939 (D. Tiedman), in the Los Angeles County Museum. Paratypes, same locality, in the Los Angeles County Museum, the Canadian National Collection, and collection Sperry. *Comstocki* form *waltoni*: holotype, male, and allotype, female, Yosemite National Park, California, May 6, 1937 (M. L. Walton), in the Los Angeles County Museum. Paratypes, same locality, in the Los Angeles County Museum and the Canadian National Collection.

DISTRIBUTION: Occurs all through the Sierras from southern Oregon (Klamath Lake) to the San Bernardino, San Gabriel, and Greenhorn ranges in the south.

Hydriomena glaucata Packard

Plate 2, figures 20, 21; text figures 74-76, 163

Cidaria glaucata PACKARD, 1874, Proc. Boston Soc. Nat. Hist., vol. 16, p. 20, pl. 1, fig. 6.

Hydriomena californiata form *glaucata*, PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 96.

Hydriomena ruberata var. *glaucata*, SWETT, 1915, Canadian Ent., vol. 47, p. 62.

Hydriomena glaucata, BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 31 (*partim, nec* pl. 6, fig. 4). SWETT, 1918, Canadian Ent., vol. 50, p. 295. MCDUNNOUGH, 1944, Bull. Southern California Acad. Sci., vol. 43, pt. 1, pl. 24, pl. 9, fig. A (male adult), pl. 10, fig. 1 (genitalia of holotype).

The correct identity of this much misidentified species was established in 1944. At the present time there is before me for study the entire material collected by the Channel Islands Biological Survey of the Los Angeles County Museum in 1941. This consists of one male, Santa Catalina Island, March 4, the specimen figured by me in 1944 (pl. 9, fig. A), although the date given is wrong; one male and one female, Santa Cruz Island, March 24 and 23, respectively; one rather aberrant female, Santa Cruz Island, bred from oak, emerged April 12; all these specimens are in the Los Angeles County Museum. From the Canadian National Collection one female, Santa Cruz Island, March 23, and one female, Santa Rosa Island, April 1, were sent for study. In the author's collection, through the courtesy of the Los Angeles County Museum authorities, are two males, Santa Catalina Island, February 27 and March 3, and one fe-

male, February 26. Besides these, two males and one female in very perfect condition, collected by W. Bauer at Inverness, Marin County, April 12, 1947, have been available for examination, one of the males being figured (pl. 2, fig. 21). Genitally they agree perfectly with the other specimens but vary considerably from them in coloration of the primaries which in both sexes are a rather even pale greenish color crossed by a somewhat obscure, darker, antemedian band; line I is very fine and slightly sinuate, and the other lines and bands are improminent. The secondaries are white, with a faint smoky tinge. The palpi in both sexes are long.

Apart from considerable variation in the size of the male specimens expense (wing 25–30 mm. from tip to tip), the maculation of the island series is very similar to that of the figur in the 1944 paper. The two exceptions mentioned therein as having somewhat shorter palpi and a dark median shade along the inner margin are now in the author's collection, and slides of their genitalia show no appreciable differences from slides of other males, especially the slide of the Inverness specimen. They agree, in regard to the dark shade, with the female bred from oak, the genitalia of which are almost an exact match with the holotype genitalia as figured in 1944. It may, therefore, be safely concluded that this dark shade and also the variation in palpal length have no specific value. It should be mentioned that the bred female shows a definite grayish shade on the primaries, owing probably to breeding conditions, as often happens. A male specimen showing the above-mentioned dark shade is figured (pl. 2, fig. 20). Four slides of female genitalia show great similarity and scarcely differ from a slide of the holotype as figured.

MALE GENITALIA: (Based largely on the Marin County specimen). Uncus with very short neck; forks very long, tending to broaden apically, apices rounded and little depressed; incision very deep and U-shaped; ventrally with scattered long hairs in the apical section. Tegumen with the shoulder slightly indicated, but not nearly so prominent as in *muscata*, broadening gradually to base; inward chitinized projections rather large and triangular. Finger-like processes from transtilla long and thin. Clasper broad

and chunky as usual with sinuate ventral margin. Costobasal tubercles rather large, especially tubercle I which, as usual, gives rise to a thin, sickle-shaped, chitinous ribbon; tubercle II obliquely placed, with usual tuft of long knobbed hairs and with a very fine chitinized hair adjacent to tubercle I. Juxta plate high and narrow, the edges tending to be perpendicular in the apical third and then sloping gently inward to a rather broad, scarcely stalked base (variants occur with somewhat narrower base and more concave sides in basal half; see fig. 76); apical projections moderate, the usual tufts of long hairs very fine and improminent, often rubbed off. Vestiture of plate composed of very fine, quite long, scattered setae, scarcely differentiable from the apical ones; marginal, thinly chitinized band well developed in the basal half of plate, narrow and often obsolescent apically; space between base and margin of sacculus narrow. Anellus strongly spiculate. Aedeagus long and of even width throughout, the sides apically reënforced with chitinous strips.

FEMALE GENITALIA: (Based on a Marin County specimen). Ostium and membranous neck as usual. Chitinous half collar slightly twisted to the right. Ductus bursae long, well chitinized, with parallel sides, terminating in a centrally placed pair of digitabula, their dorsal edges joined and projecting distad as a strong pointed spine, varying considerably in apparent length according to the position on the slide. Partial septum long but rather weak. Bursa membranous, oval, its dorsal attachment quite close to the proximal end of the ductus. The initial small sac of the ductus seminalis projecting to the left and attached to a curved chitinous base.

TYPE: Holotype, female, Santa Clara County, California, in the American Museum of Natural History.

DISTRIBUTION: Known from Marin County, Santa Clara County, and the islands off the southern coast of California. Extends probably northward, at least as far as Mendocino County.

REMARKS: Two very worn males from Laytonville, Mendocino County, appear to belong here according to genitalia; one is from the Sperry collection, the other, dated May 30, is in that of the author. The maculation of

the primaries of these specimens, as far as can be told, appears quite pale, with a faint greenish suffusion. The antemedian band is darker, more olivaceous, and band II, crossing it, is quite prominent; line I black and slightly bowed outward below costa; line III rather rigidly oblique, merely slightly crenulate. The palpi are definitely long. When better specimens are obtainable they may prove closer to the typical form than are the specimens from the Channel Islands.

A third male from the same locality in the Sperry collection, dated September 7, 1949, is still more worn than the previous two. Except for the darker median band, the maculation is almost entirely rubbed off. As far as can be deciphered it would seem to agree fairly well with the other two, except that line I is more angled below costa. The palpi also agree in their length. The genitalia, however, show the distinct shoulder in the tegumen which is supposed to characterize *muscata*; the juxta plate is also variant, the sides being perpendicular in the apical third and then strongly curved inward and slightly sinuate to the rather narrower base. If the date of capture be correct it would point to a possible second generation or to a distinct species.

Finally a fourth male in the author's collection, also taken at Laytonville, March 27 (R. F. Sternitzky), is in much better condition. Its genitalia agree very closely with those of the preceding specimen, but the palpi are shorter. According to these characters it would fall under *muscata*, but the maculation of its primaries is so different and so closely allied to that of the three above-mentioned males that placement under this name seems impossible. The ground color of the primaries is pale, with a slight olivaceous or greenish tinge. A very dark antemedian band stands out prominently; it is bordered on its basal side by the black line I which is rather evenly oblique, with only very slight outward angles on the cubitus and just above inner margin; its outer margin is formed by line III which is quite irregular in contrast to that of the other three specimens, bending inward across the cell and with a sharp outward angle above vein 1. Line IV is weak, except below costa, shows little inward bend in the cell, and is distinctly crenulate in its

lower portion; its termination on the inner margin is well removed from line III. Band V is very thin. The secondaries are whitish, crossed by a curved and slightly crenulate black postmedian line.

It is quite possible that these four specimens merely represent variants of a single species; as far as maculation goes they appear to fit in better with the holotype than do the specimens from Marin County. When more material is available it may be found that the species breaks up into several subspecies, but at the present time, with due regard to the poor condition of the unique type, it seems hardly feasible to propose doing this.

Hydriomena muscata Barnes and McDunnough

Text figures 77, 78

Hydriomena muscata BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 26, pl. 4, fig. 9 (holotype), pl. 9, fig. 4 (genitalia of paratype). MCDUNNOUGH, 1944, Bull. Southern California Acad. Sci., vol. 43, pt. 1, pp. 25, 26.

As already indicated, the name was based on three male specimens captured in Sonoma County, California, in February. Since the description very few specimens have been taken and these only of the male sex. In the Canadian National Collection there is a male from Petaluma, Sonoma County, April 1, 1935 (E. C. Johnston), and several more males have been secured in the same locality by W. Bauer, one of these being in the author's collection, taken April 1, 1946. These specimens are all very similar. The palpi are much shorter than those of *glaucata* and slightly shorter than in *crokeri*. The primaries appear quite dark in coloration and are suffused with a mossy green shade; there is a variable amount of white shading in the cell area of the postmedian band which may continue into the subterminal area; on the costa, beyond the postmedian band are three small, semirectangular, dark patches, and below the middle one a somewhat larger dark patch, opposite the inward curve of line IV and resting on band V. The angled nature of line I and the very slight crenulate nature of line III are mentioned in the original description; these characters are constant in the few speci-

mens examined. The secondaries are rather deep smoky, with a heavier shade along the outer margin; the whitish fringes, very slightly checkered with smoky, contrast quite sharply.

MALE GENITALIA: (Based on a *Petaluma* specimen that agrees with the genitalia of the holotype). Uncus neck short and rather thin; forks very long and weakly chitinized, with deep U-shaped incision between (the apical twist of the right fork in the illustration is not normal); ventral apical section with long scattered hairs. Tegumen with a strong shoulder below base of neck, broadening rapidly and shorter than in *glaucata*; inward chitinous projections moderate in size, triangular. Finger-like processes from transstilla very thin and quite long. Clasper broad and much as usual, the ventral edge gently sinuate; costobasal tubercle I quite large, the chitinized sickle-shaped ribbon arising from its apex rather thin; tubercle II smaller than normal, very obliquely placed, with the usual tuft of knobbed hairs and with a distinct chitinized one adjacent to tubercle I. Juxta plate high and tapering less than usual to the base, the lateral edges being very slightly convex; base rather broad and not noticeably stalked; apical projections quite weak but

with obvious tufts of long hairs; squamation of plate composed of fine, rather long, scattered setae; marginal, thinly chitinized band fairly broad and quite obvious in the basal half; space between base and margin of sacculus very narrow. Anellus rather strongly spiculate. Aedeagus fairly long, tapering slightly in apical half; vesica unarmed.

FEMALE GENITALIA: Unknown but will probably show the double digitabula of the allied species.

TYPES: Holotype, male, and two male paratypes, Sonoma County, California, February, in the United States National Museum, *ex* collection Barnes.

DISTRIBUTION: So far known only from Sonoma County, California (*Petaluma*).

Hydriomena chiricahuata Swett

Text figures 79, 80, 164

Hydriomena chiricahuata SWETT, 1909, Canadian Ent., vol. 41, p. 231 (*partim*); 1915, *ibid.*, vol. 47, p. 60; 1918, *ibid.*, vol. 50, p. 294. BARNES AND McDUNNOUGH, 1912, Contributions to the natural history of the Lepidoptera of North America, vol. 1, no. 4, p. 31, pl. 14, fig. 21 (holotype); 1917, *op. cit.*, vol. 4, no. 1, pp. 20, 29, pl. 5, fig. 5. McDUNNOUGH, 1944, Canadian Ent., vol. 76, p. 208.

PLATE 1

1-2. *Hydriomena exculpatata josepha* McDunnough. 1. Male, holotype, Chief Joseph Mountain, Joseph, Oregon (the American Museum of Natural History). 2. Female, allotype, Chief Joseph Mountain, Joseph, Oregon.

3. *Hydriomena exculpatata nanata* McDunnough, male, holotype, Jefferson Notch, New Hampshire (Canadian National Collection).

4. *Hydriomena expurgata nicolensis* McDunnough, male, holotype, Nicola, British Columbia (Canadian National Collection).

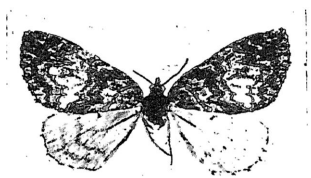
5. *Hydriomena expurgata alticola* McDunnough, male, holotype, Estes Park, Colorado (Canadian National Collection).

6-10. *Hydriomena borussata* Barnes and McDunnough. 6. Female, normal maculation, Quaking Aspen, Tulare County, California. 7. Male, normal maculation, Mt. Shasta, Siskiyou County, California. 8. Female, aberrant, Mt. Shasta, Siskiyou County, California. 9. Female, aberrant genitalia, Mt. Shasta, Siskiyou County, California. 10. Female, closest to type of *henshawi*, Greenhorn Mountains, Kern County, California (Los Angeles County Museum).

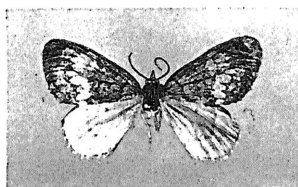
11. *Hydriomena perfracta marmorata* Barnes and McDunnough, male, Johnsville, Plumas County, California.

12. *Hydriomena divisaria brunnescens* McDunnough, female, allotype, Ithaca, New York (collection Franclemont).

13-21. *Hydriomena divisaria frigidata* Walker. 13. Male, typical, Mt. Uniacke, Halifax County, Nova Scotia. 14-15. Males, large forms, Port Wallis, Halifax County, Nova Scotia. 16. Female, large form, Mt. Uniacke, Nova Scotia. 17. Female, small, aberrant, Mt. Uniacke, Nova Scotia. 18. Female, aberrant, Mt. Uniacke, Nova Scotia. 19. Female, very large, Mt. Uniacke, Nova Scotia. 20. Male, large form, Granville Ferry, Nova Scotia. 21. Female, large form, Annapolis Royal, Nova Scotia.



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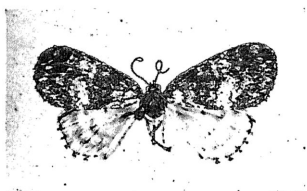
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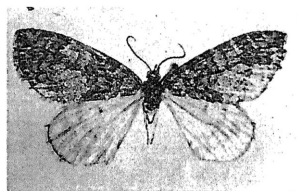
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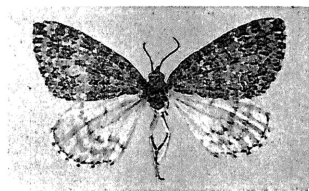
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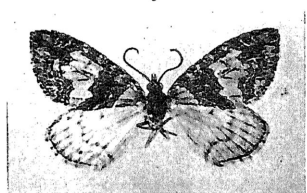
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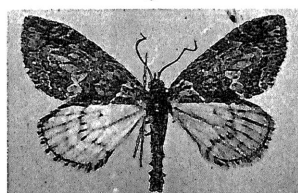
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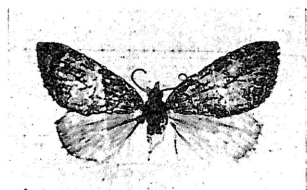
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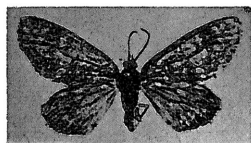
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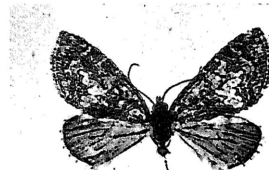
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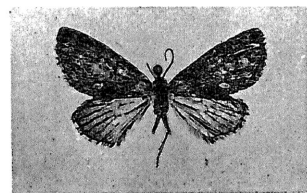
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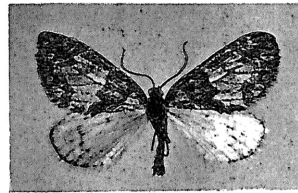
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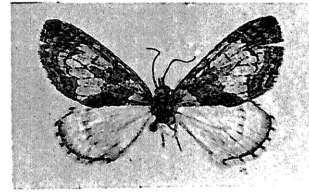
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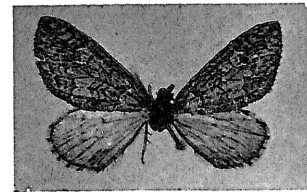
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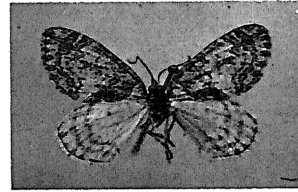
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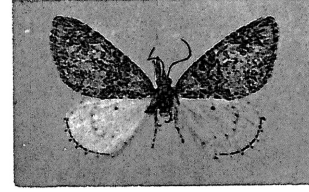
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The original description was based on two male specimens from the Chiricahua Mountains and the Huachuca Mountains, Arizona, respectively. It was later found that two species were involved, and the type was naturally restricted to the specimen from the Chiricahua Mountains which was in the Barnes collection and had already been figured (1912). A fair series of males was collected by Comstock and Martin in 1947 in the Madera Canyon, Santa Rita Mountains, southern Arizona, during the latter half of July and early August; this material is distributed in the collection of the Los Angeles County Museum, the Sperry collection, and that of the author. In 1949 L. Martin took a single female in the same locality on August 14 which, while somewhat larger than the males previously collected, appears to be correctly placed under this name. It is the only female that has been available for study, and its genitalia serve as a basis for the illustration given (fig. 164). After a study of the female specimen in the Canadian National Collection from Prescott, Arizona, collected

in July, 1909 (R. Kunze), and its genitalic slide there is some doubt in the author's mind as to whether he was correct in 1944 in assigning it to this species. There are certain differences in the maculation, notably in the course of the subbasal line (line I), and the genitalia do not match very well. Unfortunately the palpi are missing, so these cannot be compared with those of the Santa Rita Mountains specimen. Undoubtedly the two are very close, but the material is too limited for definite statements to be made at the present time. It was suggested in the previous article that *chiricahuata* and *modestata* might be forms of a single species. This may be true as far as the Prescott female is concerned but is not so according to the genitalia of the series from the Santa Rita Mountains. For this reason the two names are considered here as referring to distinct species.

MALE GENITALIA: (Based on a specimen from Santa Rita Mountains). Uncus neck short and broad; forks broad, widely separated by a U-shaped incision, slightly bowed

PLATE 2

1. *Hydriomena marinata* Barnes and McDunnough, female, large, Spring Mountain, Napa County, California.

2-7. *Hydriomena renunciata* Walker. 2. Female, holotype, United States (British Museum). 3. Male, typical, Auburn, Kings County, Nova Scotia. 4. Male, dark form, Centreville, Kings County, Nova Scotia. 5. Male, dark form, Armdale, Halifax County, Nova Scotia. 6. Male, light form, Waverley, Nova Scotia. 7. Female, Armdale, Nova Scotia.

8. *Hydriomena renunciata pernigrata* Barnes and McDunnough, female, Mohawk, Plumas County, California.

9. *Hydriomena renunciata viridescens* McDunnough, male, holotype, Inverness, Marin County, California.

10. *Hydriomena edenata edenata* Swett, male, typical, Spring Mountain, Napa County, California.

11. *Hydriomena edenata baueri* McDunnough, male, holotype, Anderson Springs, Lake County, California (the American Museum of Natural History).

12-13. *Hydriomena transfigurata* Swett. 12. Male, Hampton, New Hampshire. 13. Male, suffused, Weston, Massachusetts.

14-15. *Hydriomena pluviata* Guenée. 15. Female, allotype of *transfigurata* Swett (Museum of Comparative Zoölogy). 15. Female, Barnstable, Massachusetts.

16. *Hydriomena pluviata meridianata* McDunnough, male, holotype, Crailhope, Green County, Kentucky (the American Museum of Natural History).

17. *Hydriomena furtivata* McDunnough, male, paratype, White Mountains, Arizona (Canadian National Collection).

18. *Hydriomena crokeri comstocki* McDunnough, male, holotype, Yosemite National Park, California (Los Angeles County Museum).

19. *Hydriomena crokeri comstocki* form *waltoni* McDunnough, male, holotype, Yosemite National Park, California (Los Angeles County Museum).

20-21. *Hydriomena glauca* Packard. 20. Male, Santa Catalina Island, California. 21. Male, Inverness, Marin County, California.

outward, broadening apically, with the apices rounded and little depressed; ventral surface with long fine setae. Tegumen with trace of a shoulder, broadening rapidly, and rather short; inward chitinous projections small, triangular. Finger-like processes from transtilla long and thin. Clasper much as usual, ventral edge slightly sinuate; costobasal tubercle I of normal size, giving rise to a rather thick, sickle-shaped, chitinous ribbon; tubercle II much reduced and placed very obliquely, with the usual tuft of curved knobbed hairs and with a prominent chitinized hair adjacent to tubercle I of about half of the thickness of the afore-mentioned ribbon. Juxta plate high and narrow, the apical projections moderately strong, with the usual tufts of scattered long hairs; lateral edges perpendicular in the apical half, then gently incurved and poorly defined to a rather broad (width varying in individuals) and not very obviously stalked base; marginal, thinly chitinized band prominent in the basal half of plate; vestiture of plate composed of rather long, fine, scattered setae; space between base of plate and sacculus edge narrow. Anellus finely spiculate. Aedeagus thin, with the usual lateral thickening apically; vesica unarmed.

FEMALE GENITALIA: (Based on a specimen from Santa Rita Mountains). Membranous ostium and neck with the chitinous terminal collar quite normal. Ductus bursae well chitinized, broad, and rather short, slightly bulging on right side; extended considerably farther on the left ventral side than on the right so that the distal edge runs very obliquely upward from left to right. A large digitabulum attached to the ductus extension on the left side and placed in the normal position on the left proximal corner of the membranous bursa. Partial septum weak, with an incipient second digitabulum attached to its distal end. Bursa rather small, oval, its dorsal attachment to the ductus slightly proximad of its median area.

TYPE: Holotype, male, Chiricahua Mountains, Arizona, United States National Museum, *ex* collection Barnes.

DISTRIBUTION: Known definitely from the Chiricahua, Huachuca, and Santa Rita Mountains of Southern Arizona. Will probably occur in all the mountain chains of this region.

REMARKS: Six rather worn male specimens, taken by A. L. Melander in Miller Canyon, Huachuca Mountains, Arizona, in late April and early May, 1948, and now in the Sperry collection and that of the author may represent a spring generation of this species. They are considerably larger in size but neither in maculation nor genitalia do they differ appreciably from typical specimens taken in July and August.

Hydriomena modestata Barnes and McDunnough, new status

Text figures 81, 82, 165

Hydriomena bistrisolata var. *modestata* BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 29, pl. 5, fig. 4 (holotype), pl. 9, fig. 5 (male genitalia).

Hydriomena chiricahuata modestata, McDUNNOUGH, 1944, Canadian Ent., vol. 76, p. 208; 1952, Amer. Mus. Novitates, no. 1592, p. 10.

The reasons for elevating *modestata* to specific rank are partially explained above in the text of *chiricahuata*. Apart from the type series from Glenwood Springs, Colorado, and a few topotypical specimens, no further material of *modestata* has been available for study, but a careful comparison of these specimens with the female specimen from Prescott, Arizona, determined by the author in 1944 as *chiricahuata*, lead to the belief that this determination was erroneous and that the Arizona specimen is probably referable to *modestata* which, although closely allied, shows certain genitalic differences from the true *chiricahuata*, unknown to the author in 1944. The specimen figured in the 1917 revision is the female type, and this is now designated as the lectoholotype. The genitalia (fig. 165) are entirely distinct from those of *bistrisolata*, as is now definitely known from a study of the unique type female and its genitalia. They are, however, closely allied to those of *chiricahuata*, differing primarily in the somewhat longer ductus bursae, its much less oblique distal edge, and in the dorsal attachment of the bursa which is quite close to the distal end of the ductus and not nearly so proximal as in *chiricahuata*.

The palpi of *modestata* are quite long, although shorter than in *ruberata*, the typical example of the "long" palpi group. The size

of the species is considerably greater than that of *chiricahuata* as a reference to the figures in the 1917 revision will show, the female being considerably larger, however, than the male. The male antennae are quite thick but show no serration of the ventral margin. In the maculation the subbasal line is strongly and evenly outwardly oblique, whereas in *chiricahuata* this line is gently convex and less sharply oblique. In the male genitalia the main differences are found in the longer excavation between the uncus forks which show a greater basal thinness. The sides of the juxta plate are distinctly more convex, the apical projections are stronger, the marginal band is thin and improminent, and the vestiture consists of very long, fine setae. Some of these apparent differences may prove, when more material can be examined, to be unstable.

MALE GENITALIA: (Based on the allotype). Uncus neck short and thick; forks very long, thinner at base, and expanded apically; incision between them very deep, U-shaped; apices rounded and little depressed, with the usual long hairs on ventral side. Tegumen with scarcely a sign of a shoulder; inward chitinous projections broadly triangular. Finger-like processes from transtilla moderately long and fairly thin. Clasper normal, with a sinuate ventral edge; costobasal tubercle I of usual size, with a moderately wide chitinous ribbon from its apex; tubercle II with a much finer chitinized hair, adjacent to tubercle I, than was found in *chiricahuata*. Juxta plate high, with convex edges tapering to a fairly broad and little stalked base (width somewhat variable), the outline poorly defined in basal section; apical projections prominent, with the usual tufts of long hairs; thinly chitinized marginal band quite thin and improminent; space between base and edge of sacculus broader than in *chiricahuata*; vestiture of plate consists of very long, fine setae. Anellus finely spiculate. Aedeagus normal, with no armature in vesica.

FEMALE GENITALIA: (Based on holotype). Membranous ostium and neck with its chitinous collar normal. Ductus bursae well chitinized, fairly long and broad, with almost parallel edges; distal edge of ductus slightly upwardly oblique but not nearly so marked as in *chiricahuata*; partial septum very weak; a large digitabulum on the upper left corner

of the bursa and an incipient one, quite small, on the right distal side of the septum; dorsal attachment of membranous bursa to the ductus quite close to its distal end.

TYPES: Holotype, female, Glenwood Springs, Colorado, April 24–30, in United States National Museum, *ex* collection Barnes. Allotype, male, and one male paratype, same locality, April, May, in the United States National Museum. Paratype, male, same locality, May, 1895 (W. Barnes), in the Canadian National Collection. Paratype, female, same locality, May 1–8, in the American Museum of Natural History.

DISTRIBUTION: So far known only from the type locality, but will probably occur over considerable areas of the central Rocky Mountain region.

Hydriomena mississippiensis McDunnough

Hydriomena mississippiensis MCDUNNOUGH, 1952, Amer. Mus. Novitates, no. 1592, p. 11, figs. 10, 11 (types), figs. 15, 19, 24 (genitalia).

Nothing further can be added to the remarks contained in the original description; no further specimens have been available for examination.

TYPES: Holotype, male, Agriculture and Mechanical College, Mississippi, March 14, 1931 (R. E. Hutchings), in the Canadian National Collection. Allotype, same data but March 25, in the Canadian National Collection.

DISTRIBUTION: Known so far solely from the type material.

Hydriomena feminata McDunnough

Plate 3, figure 1; text figures 83, 84, 166

Hydriomena feminata MCDUNNOUGH, 1944, Canadian Ent., vol. 76, p. 208, pl. 13, fig. 2.

Beyond a few more specimens taken by W. Bauer at the type locality, Inverness, Marin County, California, no other material has been studied. Consequently little further can be added to the information contained in the original description beyond a more detailed description of the genitalia and figures of the types.

MALE GENITALIA: (Based on a topotypical specimen). Uncus neck short and moderately thick; forks very long, broadening apically, and outwardly bowed; incision between them

narrowly U-shaped; apices rounded, little depressed, and with long hairs on ventral surface. Tegumen with rounded shoulder, improminent, broadening gradually to base; inward chitinous projections small and pointed. Finger-like processes from transtilla thin and moderately long. Clasper broad, with slightly sinuate ventral edge; costobasal tubercle I normal in size, with its sickle-shaped chitinous ribbon rather thin; tubercle II small, with very weak tuft of knobbed hairs and the chitinized hair adjacent to tubercle I fully as broad as the ribbon of tubercle I. Juxta plate high and narrow; apical projections very feeble but with tufts of long hairs; lateral edges bowed outward at apex, then gently inwardly oblique to base which is fairly broad and scarcely stalked; chitinized marginal band very weak, slightly visible in basal section; space between base and sacculus margin fairly broad; vestiture of plate consists of fine, fairly long setae. Anellus very finely spiculate. Aedeagus moderately long and rather thick, well chitinized laterally at apex.

FEMALE GENITALIA: (Based on a topotypical specimen). Whole organ quite small. Ostium very broad, forming with the short neck a membranous funnel; chitinized collar as usual. Ductus bursae short, chitinized, the sides sloping gradually outward distally. Partial septum fairly strong; on the left side of its junction with the distal margin of the ductus is situated a very weak digitabulum. Bursa membranous, small, and nearly globular, its dorsal attachment to the ductus situated somewhat proximad of its lower edge.

TYPES: Holotype, female, Inverness, Marin County, California, May 3, 1940 (E. C. Johnston), in the Canadian National Collection. Allotype, same data and in same collection, but collector is W. R. Bauer. Paratype, male, in Canadian National Collection, and paratype, female, in collection Sperry.

DISTRIBUTION: Known only from Marin County, California.

REMARKS: The genitalia of the holotype as figured in 1944 differ slightly from those illustrated in the present paper, but this falls within the bounds of individual variation, a factor that must always be carefully considered in studying the organ.

***Hydriomena ruberata ruberata* Freyer**

Plate 3, figures 3, 4; text figures 85, 86, 167

Acidalia ruberata FREYER, 1833, *Neuere Beiträge zur Schmetterlingskunde*, vol. 1, p. 67, pl. 36, fig. 2.

Hydriomena ruberata, DOD, 1906, *Canadian Ent.*, vol. 38, p. 253. TAYLOR, 1906, *Canadian Ent.*, vol. 38, p. 400. SWETT, 1915, *Canadian Ent.*, vol. 47, p. 60. BARNES AND McDUNNOUGH, 1917, *Contributions to the natural history of the Lepidoptera of North America*, vol. 4, no. 1, p. 29, pl. 5, figs. 7, 8, pl. 9, fig. 6. McDUNNOUGH, 1927, *Canadian Ent.*, vol. 59, p. 241; 1944, *ibid.*, vol. 76, p. 206, pl. 13, fig. 1 (female genitalia). FORBES, 1948, *Cornell Univ. Agr. Exp. Sta. Mem.*, no. 274, p. 142.

Cidaria (Hydriomena) ruberata ab. *variegata* PROUT, 1914, in Seitz, *Macrolepidoptera of the world*, vol. 4, p. 263, pl. 10K.

This well-known species has already been more or less adequately dealt with in the various papers by Swett and the author. It occurs quite commonly in Nova Scotia in late May and early June, a fact that has not been previously recorded. The form *variegata* with dark brown antemedian band on the primaries is not uncommon with the typical form. Very characteristic of the species are its extremely long and slightly downcurved palpi; the male antennae are thin and show no ventral serration; the front is rather more bulging than usual. Figures of both forms are given.

The range of the species extends through the New England states into Nova Scotia and thence across the entire Dominion of Canada; it is quite common in northern Saskatchewan (Lloydminster) and the foothills of Alberta but comparatively rare in British Columbia. Two very small specimens from the Canadian National Collection, taken at lower altitudes (400 and 1500 feet) than *macdunnoughi* in the vicinity of Dawson, Yukon Territory, seem best referred to this species although the palpi, corresponding to the size of the insects, are somewhat shorter than normal. In the middle and far western United States it is known from Oscoda County, Michigan; Easton, Washington; and Wallowa Lake, Oregon. Two male specimens from Gothic, Colorado, 9400 feet, July 9, 10, 1932 (Lindsey), have been examined, one from the Canadian National Collection and

the other in collection Sperry. Both are rather worn, and the maculation is more or less of the *variegata* type; the palpi are longer than in *macdunnoughi* but scarcely as long as in *ruberata*; but the genitalia, based on the specimen in the Canadian National Collection, are very close to those of *ruberata*, and the specimens are being placed under this name in spite of the high altitude at which they were captured.

MALE GENITALIA: (Based on a specimen from Centreville, Kings County, Nova Scotia). Uncus neck thin and moderately long; forks very broad, swelling towards apex, about as long as neck (quite variable in individuals); apices rounded and little depressed; incision between them narrow; ventral surface with long setae. Tegumen with strong shoulder at base of neck, broadening gradually and rather short; inward chitinized projections of moderate size, very pointed apically. Finger-like processes from transtilla long and thin. Clasper much as usual; ventral margin weakly sinuate; costobasal tubercle I large, with truncate apex from which a chitinous sickle-shaped ribbon arises, rather thin and somewhat shorter than usual; tubercle II much reduced in size, with weaker tuft of knobbed hairs than usual and a strong chitinized hair adjacent to tubercle I, being only slightly thinner than the ribbon from tubercle I. Juxta plate high and rectangular, the base, including the marginal band, scarcely narrower than the apex; apical projections hardly present and long hairs apparently missing; lateral edges perpendicular and well defined in apical section, becoming obsolescent towards base, the outline defined in this sector by the broad, thinly chitinized, marginal band; vestiture of plate composed of fine scattered setae; space between base of plate and sacculus edge very narrow. Anellus strongly spiculate. Aedeagus long and fairly thick; vesica without armature.

FEMALE GENITALIA: (Based on a specimen from Centreville, Kings County, Nova Scotia). Ovipositor lobes thinly chitinized, posterior apophyses thin and very long. Ostium, membranous neck, and chitinized collar normal. Ductus bursae chitinized, quite short and broad, the convex left side continued farther cephalad than the right one, terminating in a large digitabulum on

the left, proximal side of the bursa; the distal edge of the ductus in consequence is strongly upwardly oblique from left to right. Partial septum weak. Incipient digitabulum at distal end of right side of the ductus very faint, scarcely more than a slight bulge. Bursa rather small, oval, membranous, its attachment to the dorsal side of the ductus quite close to its distal end.

TYPES: Location unknown; possibly non-existent.

DISTRIBUTION: In North America occurs across the entire Dominion of Canada from Nova Scotia to British Columbia; in the United States it is not uncommon in the New England states, and odd specimens have been reported from Michigan (Oscoda County), Colorado (Gothic), Oregon (Wallowa Lake), and Washington (Easton).

REMARKS: It should be noted that Pierce in his "Genitalia of the British Geometridae" (p. 68, pl. 43) records a cluster of cornuti in the male vesica. This cluster has not been found in any slides examined, which, however, were based largely on Nova Scotia material. A very weak cluster has been observed in slides of the very closely allied *macdunnoughi* from the Rocky Mountain region which differs otherwise in its much shorter palpi. In all other respects our North American forms agree extremely closely with British specimens as was noted by Dod, Taylor, and Prout who were all thoroughly conversant with the species in Europe. It seems therefore hardly advisable to propose a new name for our North American form, as specimens may occur in other localities farther west in which the cornuti are present. It is further quite possible that specimens from continental Europe may lack this cluster, a matter which cannot be established at the present time.

Hydriomena ruberata pallula McDunnough

Plate 3, figures 5, 20

Hydriomena ruberata var. *pallula* McDUNNOUGH, 1944, Canadian Ent., vol. 76, p. 207.

Apart from the type series of males, only one other specimen has been examined; this is a male from Lundy Creek, Mono County, California, June 7. The female is still unknown.

As noted in the original description *pallula* occurs in two forms, the paler, typical one without dark shading in the antemedian band and another which corresponds to the form *variegata* of *ruberata* and in which a broad brown antemedian band is strikingly prominent across the pale creamy ground color. One of the latter kind is figured (pl. 3, fig. 5).

The male genitalia vary slightly from those of *ruberata*, as figured, and also among themselves in the three slides examined; these differences, however, are only what one might expect in individuals from an entirely different environment. The uncus forks while retaining their broad shape vary in the extent to which they are outcurved and in one case remain very close to each other with a very narrow but deep incision between them. The shoulder of the tegumen is slightly less prominent, and in the clasper the costobasal tubercle II is better developed and the chitinized hair from it, adjacent to tubercle I, is virtually as broad as the preceding ribbon. In the juxta plate the lateral edges tend to be better defined in their basal section, and in consequence the plate appears to narrow towards the base, the marginal band being less obvious or even somewhat reduced in width. Such differences as these will probably be found to occur in the nymotypical form when more material can be examined.

Types: Holotype, male, Leevining, Mono County, California, May 12, 1939 (M. L. Walton), in the Canadian National Collection. Paratypes, three males, Bishop Creek, Inyo County, California, June 9, 1935 (Walton); one male, Big Pine Creek, Inyo County, June 17, 1937, in the Los Angeles County Museum.

Distribution: Known only from a few localities in Inyo and Mono counties, California.

***Hydriomena macdunnoughi* Swett**

Plate 3, figures 6, 7; text figures 87, 88, 168

Hydriomena macdunnoughi SWETT, 1918, Canadian Ent., vol. 50, p. 296. BLACKMORE, 1918, Ann. Rept. British Columbia Prov. Mus., pl. 2 (paratype). MCDUNNOUGH, 1944, Canadian Ent., vol. 76, p. 207.

The species is extremely closely allied to *ruberata* but may be separated primarily by

its much shorter palpi. These exceed the front by approximately its width and in the old classification would be placed as "moderate." The male antennae are quite thin and show a faint serration of the ventral margin.

Three topotypical males from Atlin, British Columbia, are in the material lent by the Canadian National Collection. Through the courtesy of Prof. G. J. Spencer of the University of British Columbia, the allotype female has also been made available for study from the University collection, *ex* collection Blackmore. These specimens are in rather poor condition and show a very obscure maculation of the primaries. A further series of 10 males from the Canadian National Collection, collected by the author in June, 1921, at Nordegg, Alberta, are in much better condition. Some of these match the Atlin specimens quite closely in maculation, but in general they are somewhat larger and at times have longer palpi, although the palpal length does not nearly approach that of *ruberata*; the genitalia match well those of Atlin specimens. Two of these specimens are figured (pl. 3, figs. 6, 7).

As regards maculation the primaries show a dull obscure appearance owing to a general suffusion of brown over the whole wing; the antemedian band is a somewhat darker brown than the remainder of the wing and at times approaches in appearance that of the form *variegata* of *ruberata*. The postmedian pale band is much obscured by brown shading and is quite improminent as a rule; it contains a fine, dark, discal streak. The black subbasal line (line I) shows more of an outward angle below costa than is normally found in *ruberata*, but the character is subject to a certain amount of variation; line III is also somewhat more irregular, especially above the inner margin where it shows a strong incurve. The secondaries are very dark smoky.

Besides the above-mentioned specimens the Canadian National Collection contains a single male from Nicola, British Columbia, and two males from Banff, Alberta, taken on June 29, 1922, which match the Nordegg specimens quite well in all respects. Two females, taken in Banff in the same year as the males, show considerably longer palpi than those of the allotype and are also much

better maculated, being in this respect quite similar to *ruberata*; in genitalia, too, they appear rather intermediate between the two species. One of the specimens possesses genitalia almost identical with the figures of *ruberata* given in 1944 and in the present article, except that the vestigial digitabulum on the right side is lacking. In the other specimen the ductus is much shorter, agreeing in this respect with that of the allotype as herewith figured. Their position is rather uncertain, but as the palpi are still considerably shorter than those of *ruberata*, they are tentatively placed as *macdunnoughi*. More material of this sex is needed to evaluate the range of variation. Among unidentified material received from the Canadian National Collection were several small specimens taken in the vicinity of Dawson, Yukon Territory, at an altitude of over 3000 feet. The short palpi and the genitalia place them definitely as this species.

Just recently a small series of worn male specimens has been received for study which were collected at Breckenridge, Summit County, Colorado, altitude 10,000 feet, July 25, 26, by R. H. Leuschner. These specimens agree in size, antennal structure, and genitalia with the Canadian material, although the palpi appear slightly longer; they seem best placed under this name.

The male genitalia are very similar to those of *ruberata*, but the whole organ is smaller. The uncus neck is slightly thinner, the tegumen shoulder is scarcely as abrupt, and the transtilla processes seem somewhat shorter and thicker. There are slight differences in the juxta plate which are best noted in the illustration; the vesica shows a faint cluster of rather scattered, small cornuti which distinguishes the species from our North American *ruberata* but allies it to the European form according to Pierce's description and illustration.

MALE GENITALIA: (Based on a Nordegg specimen). Uncus neck thin and moderately long; forks broad, increasing in width apically, bowed outward, apices rounded and little depressed, with long hairs on ventral surface; incision between forks very narrowly U-shaped. Tegumen broadly expanded below base of neck but with no sharp shoulder, increasing gradually in width towards base;

inward chitinous projections small, triangular. Finger-like processes from transtilla rather short and chunky. Clasper much as usual, with very slightly sinuate ventral edge, less so than in *ruberata*; costobasal tubercle I large and broad, with the usual chitinous sickle-shaped ribbon from its apex; tubercle II small, with rather reduced tuft of knobbed hairs and a much thinner chitinized hair adjacent to tubercle I than occurs in *ruberata*. Juxta plate rather narrow, with very weak apical projections and only slight indications of long hair tufts; the lateral edges perpendicular in apical third, then gradually and very slightly sinuately sloping inward to a rather broad base which does not appear noticeably stalked and lacks the usual rounded extension; marginal thinly chitinized band very broad and obvious, especially in basal section, incurved in median area; vestiture of plate consisting of fine, fairly long, scattered setae; space between base and margin of sacculus very narrow. Anellus strongly spiculate. Aedeagus thin, straight; vesica with faint cluster of fine cornuti (at times barely visible).

FEMALE GENITALIA: (Based on the allotype). In general fairly similar to those of *ruberata*. Membranous ostium funnel shaped, with a broad mouth, rapidly narrowing distally and terminating in the usual chitinized half collar. Ductus bursae short, well chitinized, broadening gradually from base to apex, with the left edge feebly convex and terminating in a good-sized digitabulum. Partial septum very weak, the portion of the ductus on its right distal side bulging somewhat upward as if to simulate the commencement of the vestigial digitabulum found in *ruberata*. Distal edge of ductus gently upwardly oblique from left to right. Bursa membranous, oval, its dorsal attachment to the ductus occurring close to the distal end.

TYPES: Holotype, male, Atlin, British Columbia, June 11, 1914, in Museum of Comparative Zoölogy, *ex* collection Swett. Allotype, female, same data, in collection University of British Columbia, *ex* collection Blackmore. Paratypes, same data, in both the above collections.

DISTRIBUTION: Appears to be confined to the Hudsonian zone of the Rocky Mountain region, at lower altitudes, 2000-3000 feet, in the Canadian Rockies (Atlin, Dawson, Nord-

egg, Banff), and at high altitudes, 10,000 feet, in Colorado (Breckenridge).

Hydriomena septemberata McDunnough

Hydriomena septemberata McDUNNOUGH, 1952, Amer. Mus. Novitates, no. 1592, figs. 7, 8 (types), figs. 12, 16, 16A, 21 (genitalia).

This recently described species is aberrant in both male and female genitalia but seems best placed for the present in this group.

Beyond the fact that a few more males of the small form from the type locality, Julian, have been found in the Sperry collection, nothing can be added to the information

contained in the original description.

TYPES: Holotype, female, and allotype, male, Julian, San Diego County, California, September, 1948 (N. Crickmer), in the American Museum of Natural History. Paratypes, seven males and six females, from type locality; three males, upper Santa Ana River, San Bernardino County, California; one male, Barton Flats, San Bernardino County, California; these to be deposited in several of the larger museums.

DISTRIBUTION: Interior mountain ranges of San Diego County and the San Bernardino Mountains, southern California.

GROUP II

The group is a small one containing only four species. The best known of the four is *furcata* Borgström, with a very wide distribution in the Palearctic and Nearctic faunas. The Pacific coast species (*quinquefasciata* Packard), very similar in general maculation to *furcata* and formerly confused with it, also belongs here as was to be expected. The other two included specimens (*catalinata* McDunnough and *costipunctata* Barnes and McDunnough) are known only from the type material, collected in Arizona.

The above species are readily separated from those contained in group I by characters of both male and female genitalia. In the male organ the uncus is simple, broadening rapidly towards the apex to a spatulate form, the caudal margin of which is more or less excised. In the clasper the strongly chitinized costa projects slightly beyond the weak valvula; tubercles I and II are partially concealed by a chitinous ridge, and each gives rise to a single, strongly chitinized, and much twisted ribbon; there are no knobbed hairs, but a variably strong tuft of simple hairs arises from the distal portion of the above-mentioned ridge. The most characteristic feature, however, is found in the transstilla processes which have become strongly chitinized. They vary in shape in the different species, being sharply pointed in *furcata*, *quinquefasciata*, and *catalinata*, with slightly roughened edges; in *costipunctata* they are very long, the apical half being considerably broadened, with dentate outer edges, curving

at the extreme apex to a blunt point. The cephalic portion of the tegumen is narrow and elongate and the lateral edges of the vinculum, or saccus, do not meet in their apical area, projecting slightly as rounded processes. Other differences are discussed under the individual headings.

The female genitalia are totally different from the type common to the species in group I. In *furcata* and *quinquefasciata* the ostium is very broad at its proximal end and is entirely membranous in somewhat more than its proximal half; in the distal section the walls are lightly chitinized and feebly shagreened; the extreme distal end narrows sharply and is followed by a short membranous ductus bursae, quite narrow at its inception but broadening rapidly before entering the bursa; the distal section shows a quite variable degree of light chitinization which would apparently correspond to the collar found in group I. The ductus seminalis is located at the junction of the ostium neck with the ductus bursae on the dorsal side, and arises from a small bulbous sac projecting to the right. The bursa when fully inflated is heart shaped and thinly membranous; it is attached to the distal end of the ductus, the lateral portions projecting roundedly caudad beyond the point of junction (fig. 169). In poorly inflated specimens the heart-like shape is less obvious, and the bursa appears as a more or less globular sac (fig. 170). The terminal abdominal segments are much extended and

the posterior apophyses long and thin. In *catalinata*, as based on the genitalia of the allotype, there is considerably more chitinization in the distal area of the ostium and the proximal area of the ductus; the type of bursa is similar to that of the other species. In *costipunctata* a certain amount of variation from the above-mentioned type is shown, as is only natural in a species with such divergent maculation. The main difference is found in the ductus bursae which is very broad, with convex edges, and finely spiculate over its entire surface. The bursa still remains heart shaped.

In conclusion it might be mentioned that in three of the species the palpi are quite short. In *costipunctata*, however, they are distinctly long. In spite of the differences mentioned between this species and the other three it seems advisable to place it in group II. Its main affinities may be with Mexican or Central American species, a point that cannot be decided at the present time.

***Hydriomena furcata furcata* Borgström**

Text figures 89, 90, 169, 170

Cidaria furcata BORGSTRÖM, 1784, in Thunberg, *Dissertationes entomologicae, sistens Insecta Suecica*, pt. 1, p. 13.

Phalaena sordidata FABRICIUS, 1794, *Entomologia systematica*, vol. 3, pt. 2, p. 185.

Hydriomena sordidata, PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 96, pl. 8, fig. 35 (*partim*). HULST, 1896, *Trans. Amer. Ent. Soc.*, vol. 23, p. 284.

Hydriomena furcata, PROUT, 1897, *Ent. Rec. and Jour. Variation*, vol. 9, p. 84. SWETT, 1911, *Canadian Ent.*, vol. 43, p. 74 (*partim*); 1918, *ibid.*, vol. 50, p. 293. BARNES AND MCDUNNOUGH, 1917, *Contributions to the natural history of the Lepidoptera of North America*, vol. 4, no. 1, p. 7, pl. 1, figs. 1-6, pl. 7, fig. 1 (genitalia). BLACKMORE, 1917, *Ann. Rept. British Columbia Prov. Mus.*, p. 13. MCDUNNOUGH, 1927, *Canadian Ent.*, vol. 59, p. 241. FORBES, 1948, *Cornell Univ. Agr. Exp. Sta. Mem.*, no. 274, p. 141.

Cidaria (Hydriomena) furcata, PROUT, 1915, in Seitz, *Macrolepidoptera of the world*, vol. 4, p. 263, pl. 10k; 1938, in Seitz, *op. cit.*, vol. 4, suppl., p. 169.

Hydriomena quinquefasciata DOD (*nec* Packard), 1906, *Canadian Ent.*, vol. 38, p. 253.

Beyond one or two main references, no attempt has been made to include the Pale-

arctic bibliography of this widely distributed species. In North America the species occurs in countless forms, for which European names are probably available; those interested in such names can refer to them in Prout's article in Seitz, "Macrolepidoptera of the world" (vol. 4).

The range of the species in North America has been well indicated in the 1917 revision; further material accumulated since then has served to extend this range considerably. It appears to be fairly common, although somewhat dwarfed, in several Alaskan localities. Numerous specimens in the Canadian National Collection were taken at Whitehorse and Rampart House, Yukon Territory, and from these northern points the species extends down the coast (Vancouver Island) and through the Rocky Mountain region and the coast range and Sierras as far south as the White Mountains, Arizona, and Inyo and Mono counties in California. Large quantities of material were formerly collected and distributed by O. Huellemann of Wallace, Idaho, the form predominant in this region being referable to *fuscoundata* as depicted in Seitz (*op. cit.*, pl. 10k). In the Dominion of Canada it occurs commonly in the foothill regions of Alberta and also in northern Saskatchewan (Lloydminster), and was formerly reported to extend eastward as far as the Rainy River district of Ontario (Hymers). In Quebec it was taken in numbers by E. G. Munroe at Lac Mondor, Ste. Flore, in August, 1951. It is also known to occur in Labrador, and single specimens from Goose Bay and St. Anthony, Newfoundland, have been seen in unidentified material from the Canadian National Collection. Douglas Ferguson reports that he has a record of a specimen from Bathurst, New Brunswick, the only locality, so far as is known, where it has appeared in this province. Since willow is obviously the regular food plant of the larva, as demonstrated by numerous breedings made by the Canadian Forest Insect Survey, there seems no reason to doubt that it may still be found in suitable localities across the entire Dominion.

With the information contained in the first revision (1917) and the various figures given therein illustrative of some of the numerous forms, there should be little diffi-

culty in identifying the species. It seems, therefore, sufficient to append in the present article more detailed descriptions of the genitalia of both sexes than has heretofore been done.

MALE GENITALIA: Uncus non-bifurcate, spatulate, very broad, its narrowest point being shortly beyond the base; following this it broadens gradually, its sides being gently convex and produced apically into short downcurved points, very variable in length. The caudal margin is somewhat excised to form a very broad open V. Tegumen with its caudal portion convexly rounded and quite distinct in character from that found in group I. It consists, viewed dorsally, of two lateral bands of chitin, contiguous where attached to the base of the uncus, then separating widely, leaving a large, central, inverted, V-shaped opening. The cephalic portion, consisting also of two chitinated rods, is long and narrows gradually from the median area to the free projecting apices which are rounded and only connected by a curved ventral plate at some little distance caudad of their extremities, thus forming a sort of vinculum or saccus. Transtilla strongly chitinated at base, the processes attached to it also heavily chitinated, dagger shaped, and tapering to sharp points. Clasper in general quite similar to that of species belonging to group I, rather short and broad, the basal, more heavily chitinated section triangular, the apical portion (valvula) weak, broadly rounded, and covered on the ventral surface with long hairs arising from small papillae. Costa strengthened by a strip of chitin of even width throughout, projecting slightly beyond the valvula, with short spine on its inner edge; costobasal tubercles present as in group I but partially concealed by a chitinous flap and directed dorsad. The single ribbon from tubercle I is strongly chitinated, twisted, and ends in a bent point; tubercle II also gives rise to a single ribbon, very much curved, broadening apically, and flatly compressed; there are no knobbed hairs, but a strong cluster of ordinary long, recurved hairs arises apicad of tubercle II. Juxta plate high and narrow, broadening apically, its edges, except apically, poorly defined but considerably strengthened by chitin at the projecting apices; a very broad

marginal band of weak chitin extends down the full length of each side. Anellus strongly spiculate. Aedeagus thin, bent strongly ventrad beyond middle, broadening flange-like apically, the sides strengthened with chitin and giving rise on the dorsal side to bunches of short spines; the vesica appears to show a thin spiculate band, situated apically.

FEMALE GENITALIA: Ovipositor lobes long, pointed, very weakly chitinated, with V-shaped incision between them; sparsely covered with long hairs; posterior apophyses very long and thin. Ostium broad and very weakly chitinated for rather more than its proximal half, then roundedly narrowing, the sides strengthened with chitin and feebly spiculate. Initial portion of membranous ductus bursae considerably constricted, then broadening with more or less parallel sides to continue for a short distance to join bursa, a variable and irregularly defined patch of weak chitin marking the junction. Bursa large, membranous, heart shaped (when fully inflated), the lateral areas bulging roundedly caudad on each side of the ductus. In poorly inflated specimens, which frequently occur, the bursa appears as a globular sac, broadly attached to the end of the ductus. Ductus seminalis arises from a small membranous sac situated dorsally at the proximal end of the ductus bursae and projecting to the right.

TYPE: Location unknown, probably non-existent.

DISTRIBUTION: In North America widespread over the western half of the Dominion of Canada. Extending from Alaska and Yukon Territory in the north along the Rocky Mountains, Cascades, and Sierras to points as far south in the United States as Inyo and Mono counties in California and the White Mountains in Arizona. In the eastern half of North America its distribution is less well defined. It has been reported from time to time from virtually every province of the Dominion. Forbes gives its distribution as "Northwestern U. S. east to Laniel, Quebec; the plainer dull smoky variety *saga* Prout in Labrador."

LARVAL FOOD PLANT: Willow (*Salix* spp.)

REMARKS: In the present drawing (fig. 89) of the male genitalia from a specimen from Wallace, Idaho, the uncus shows a slight

variation from the more normal form as shown in the figure given in the 1917 revision.

***Hydriomena furcata fergusoni*,
new subspecies**

Plate 3, figures 8, 9

What appears to be a very interesting subspecies of *furcata* was taken at light by Douglas Ferguson on August 18 and 20, 1952, at Peggy's Cove, a small fishing village situated about 20 miles, "as the crow flies," southwest of Halifax. The surrounding area is granitic rock and very barren, with no growth of trees except possibly a few scattered spruce. In the sheltered hollows between the rocks small areas of bog occur, with their typical bog flora, and the edges are frequently bordered with a considerable growth of *Myrica*, but, as far as is known, no willow, the normal larval food plant, occurs in the vicinity.

The specimens are of small size with a wing expanse, from tip to tip of primaries, of approximately 25 to 28 mm. The chief characteristic is the narrowness of the pale postmedian band of primaries which is scarcely more than half of the width of that of normal western specimens and is cut, at least in the four male specimens examined, by a black line along the cubital vein at the junction of veins 3 and 4. The coloration varies from a reddish brown to a dull smoky brown, and the pale basal and postmedian areas may at times be considerably suffused with darker scaling, rendering them in consequence quite indistinct. The five cross lines and bands are as in the typical form, being blue-black in color. There is no obvious white patch in the subterminal area. The secondaries are deep smoky brown, with slightly checkered fringes.

The author takes much pleasure in naming the subspecies after Douglas Ferguson who has contributed so greatly to our knowledge of the lepidopterous fauna of Nova Scotia by his intensive collecting at light in various areas of the province. The capture of the present series is the first known occurrence of *furcata* in Nova Scotia.

HOLOTYPE: Male, Peggy's Cove, Halifax County, Nova Scotia, August 18, 1952 (D. C. Ferguson), in the Canadian National Collection.

ALLOTYPE: Female, same data, in same collection.

PARATYPES: Three males, three females, same data; one female taken August 20. These specimens remain in the author's collection for the present but will be distributed later to various museums.

***Hydriomena quinquefasciata* Packard**

Text figure 171

Hypsipetes quinquefasciata PACKARD, 1871, Proc. Boston Soc. Nat. Hist., vol. 13, p. 397.

Hypsipetes viridata PACKARD, 1874, Proc. Boston Soc. Nat. Hist., vol. 16, p. 21; 1876, A monograph of the geometrid moths . . . of the United States, p. 100 (synonym).

Hydriomena quinquefasciata, PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 100, pl. 8, figs. 36. BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 8, pl. 1, figs. 7, 8, pl. 6, fig. 10 (holotype), pl. 7, fig. 2 (genitalia). SWETT, 1918, Canadian Ent., vol. 50, p. 293.

Hydriomena sordidata var. *quinquefasciata*, HULST, "1902" [1903], in Dyar, Bull. U. S. Natl. Mus., no. 52, p. 282.

Hydriomena sordidata var. *viridata*, HULST, "1902" [1903], in Dyar, Bull. U. S. Natl. Mus., no. 52, p. 285.

Hydriomena furcata var. *periclata* SWETT, 1910, Canadian Ent., vol. 42, p. 283; 1911, *ibid.*, vol. 43, p. 77; 1918, *ibid.*, vol. 50, p. 295. BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 8. BLACKMORE, 1916, Ann. Rept. British Columbia Prov. Mus., p. 24, pl. 8.

Hydriomena furcata var. (a) *quinquefasciata*, SWETT, 1911, Canadian Ent., vol. 43, p. 76 (*partim*). BLACKMORE, 1915, Ann. Rept. British Columbia Prov. Mus., p. 26.

Hydriomena furcata var. (B) *viridata*, SWETT, 1911, Canadian Ent., vol. 43, p. 76.

Hydriomena quinquefasciata form *viridata*, BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 9, pl. 1, fig. 9, pl. 6, fig. 11 (holotype).

As may be seen by a glance at the above bibliography, the species was for a long time considered as a variety of *furcata*, and it was only after a study of genitalia that its status as a good species was recognized. Its male genitalia are similar in most points to those of *furcata* but differ in the shape of the uncus, as may be readily seen by a reference to the illustrations given in the 1917 revision (pl. 7,

figs. 1, 2). For this reason no further drawings have been considered necessary.

The species seems to be largely confined to the Pacific coastal regions, extending from Vancouver Island to the central counties of California (Napa, Marin, Santa Cruz) and as far south as Los Angeles County. The Canadian National Collection contains a good series of specimens from various points in southern Vancouver Island; also a small number from Marin County (Inverness), Sonoma County (Petaluma), and Santa Cruz County. Single specimens in the Los Angeles County Museum are from Pepperwood, Humboldt County, Russian Gulch National Park, Mendocino County, and Long Beach, Los Angeles County; a single female of the form *periclata* was collected on Santa Rosa Island. The 1917 revision reports single specimens examined from Verdi, Nevada; Plumas County, California, and Summit, Nevada County, California, but these data need further checking, as no material from the Sierras has been seen in any collections recently examined.

Like *furcata*, the species is very variable both in coloration and maculation of the primaries. The typical form is of a grayish ground color with the maculation fairly well defined. Packard's figure in the monograph (1876, pl. 8, fig. 36) is either a poor representation or a different species. The figure of the holotype female in the Barnes and McDunnough revision (pl. 6, fig. 10) is quite recognizable and has been closely matched by a male in the Canadian National Collection from Petaluma, Sonoma County. Many specimens, notably those from Vancouver Island, show a sprinkling of green scales; when this is intensified to obscure other shades and at the same time hide the maculation, we have the form *viridata* (Barnes and McDunnough, 1917, pl. 6, fig. 11). Most of the specimens examined from Inverness, Marin County, show considerable ruddy suffusion over the pale areas, with the maculation still quite distinct. When this becomes suffused with darker shades the form *periclata* is indicated. Typically there is a scattered green sprinkling over the wing but, as the description states, this is not always present. There are, of course, any number of intergrades between the forms that have already received names, but it is to be hoped that no overenthusiastic entomolo-

gist will have the urge to apply names to them.

As regards the distinctions in maculation between this species and *furcata*, nothing further can be added to the points mentioned in the 1917 revision. These hold good in a majority of cases but are by no means infallible; in doubtful cases the genitalia are the only sure means of separation.

From the dated material examined from the Canadian National Collection there would appear to be at least two and possibly three generations. The Marin County specimens were taken around February 15, a Long Beach male in March, while a few of the Victoria, British Columbia, specimens bear dates in late April. Sonoma County specimens, on the other hand, show dates in late May and June, and the majority of the Vancouver Island material was captured in June; two females in the series, however, are dated "August" and "Sept. 7," respectively. It will require careful breeding to determine whether or not the early generation shows distinctive characteristics from the summer one.

MALE GENITALIA: Very similar to those of *furcata* in all points except the uncus; this shows a very broad base without contraction, the sides broadening gradually and convex to apex, ending in thin spines of variable length, curving ventrad; the caudal edge is straight, not evaginate as in *furcata*. The transtilla processes, while quite similar, are shorter, and their outer edges are slightly dentate. Tubercles I and II are directed dorsad as in *furcata* but are not hidden by a plate of chitin; the ribbons arising from them are much the same as in the allied species. The juxta plate, while of the same general shape, is not so high as in *furcata*, and the outer bands of chitin, while present, are very inconspicuous. The aedeagus is somewhat shorter but similar in shape and with the same armature.

FEMALE GENITALIA: Also very similar to those of *furcata*. Very fragile. The membranous portion of the ostium is shorter, but the distal chitinization is much the same. The ductus bursae shows no proximal contraction and is of practically even width throughout.

TYPES: Holotype, female, California, in Museum of Comparative Zoölogy. Form *viridata*, holotype, female, California, in Museum of Comparative Zoölogy. Form *periclata*, holo-

type, male, Land's End, San Francisco, California, in Museum of Comparative Zoölogy, ex Swett collection.

DISTRIBUTION: Pacific coast areas from Vancouver Island to Los Angeles County, California, possibly extending eastward in some localities into the Sierras.

***Hydriomena catalinata* McDunnough**

Plate 3, figures 18, 19; text figures 91, 92, 172

Hydriomena catalinata MCDUNNOUGH, 1943, Canadian Ent., vol. 75, p. 216.

Apart from the male and female types, no other specimens of this species are known. The types themselves have not been available for examination, so nothing can be added to the information contained in the original description. Photographs of these have, however, been supplied. Slides of both male and female genitalia have been borrowed from the Canadian National Collection, and from these the following descriptions have been drawn up and illustrations given (figs. 91, 92, 172).

MALE GENITALIA: Uncus very broad at base, the sides curving gently inward for a short distance and then bowed outward and convex, terminating in short blunt points; the caudal margin somewhat excised much as in *furcata*. Tegumen broad and strongly rounded apically, much wider than in *furcata*; viewed dorsally the triangular opening is less prominent than in *furcata*, owing to the thinly chitinized nature of the sides. Transtilla processes strongly chitinized as in the other species of the group, much longer and broader than in *furcata*, blade shaped, with a very finely dentate edge. Clasper with its costobasal tubercles and their chitinous ribbons much as in *furcata*; the broadly chitinized costal margin, however, projects farther beyond the edge of the valvula, terminating in a blunt point. Juxta plate with slightly more than its basal half very narrow and upright, the sides then convex and broadening rapidly to form a bowl-shaped apex; a broad, very thinly chitinized band extends along the lateral margin. Vinculum apices rounded and separated much as in the other species. Anellus heavily covered with short, blunt, hair-like processes. Aedeagus very long, slightly bent but not so strongly as in *furcata*; apices broadening

flange-like, the sides with strong clusters of short spines, much as in *furcata*; vesica appears to be without armature.

FEMALE GENITALIA: Ostium very broad and membranous, much as in *furcata*; at its distal end it appears to show a central, rather narrow opening, bordered weakly by a chitinized and granulate area with faint transverse striation. The initial portion of the ductus bursae is strengthened laterally with chitinous strips, longer on the right side than on the left; the terminal half is membranous and evenly broad but rather short. The bursa is membranous and heart shaped, much as in the other species of the group, the ductus entering broadly the central area of its caudal edge. The exit of the ductus seminalis could not be discerned.

TYPES: Holotype, male, allotype, female, Santa Catalina Mountains, Arizona, in Canadian National Collection. Date of capture doubtful, either June 15 or August 15.

***Hydriomena costipunctata* Barnes
and McDunnough**

Text figures 93, 173

Hydriomena costipunctata BARNES AND MCDUNNOUGH, 1912, Contributions to the natural history of the Lepidoptera of North America, vol. 1, no. 5, p. 31, pl. 2, fig. 14; 1917, *op. cit.*, vol. 4, no. 1, p. 36, fig. 12. SWETT, 1915, Canadian Ent., vol. 47, p. 10.

As it was stated in the original description that the female type was the better specimen and as it was also figured, it is proposed to make it the lectoholotype.

It has been possible to examine the types and to make slides of their genitalia from which the present illustrations (figs. 93, 173) are drawn. No other specimens have been located in any of the collections examined. This striking species should be readily identified from the original illustration. It bears little resemblance to the other species of the group in either coloration and maculation or in palpal length, the palpi being distinctly long. However, the genitalia show sufficient points of resemblance to warrant placement with the others, at least for the present.

MALE GENITALIA: Uncus neck short and quite narrow, compared with the other species of the group; following this the sides are sharply outcurved and strongly convex,

rounded at apex; the caudal margin shows a deep, median, U-shaped excavation, each side showing a small spine situated at its proximal end on the ventral side. Tegumen rounded apically, sides gently sloping outward, less broad than in the other species. Transtilla processes long and very strongly chitinized, blade shaped, the outer margin dentate, the inner margin more heavily chitinized to form a thin supporting rod. Clasper of the same general type as in the other species except that the chitinized costal band broadens considerably towards its apex, is then curved downward, and terminates in a short spine; the valvula is twisted dorsad in this section, and its attachment to the costa is difficult to visualize but appears to be near the base of the spine. Tubercles I and II are situated on the dorsal side of a chitinous band, tubercle II being much recurved, as usual, in its initial section. Juxta plate very faintly defined; it appears to be narrow and upright for its greater part, broadening somewhat and more strongly chitinized at its apices which terminate bluntly; a broad, but very weakly chi-

tinized marginal band is present. Vinculum much as in the other species. As regards the aedeagus it was found later, after the slide had been returned, that no note had been made regarding its structure, and certain circumstances have arisen which make it impossible at the present time to secure the necessary information regarding the organ. It might also be well to state that a large costal hair tuft on the clasper has been omitted from the drawing in the interests of clarity.

FEMALE GENITALIA: Ostium membranous, with leaf-like chitinous thickenings at its distal end. Ductus bursae very broad and sack-like, membranous, with very fine spiculation over its entire surface; it is broadly attached to the heart-shaped membranous bursa. The origin of the ductus seminalis could not be traced.

TYPES: Holotype, female, Redington, Arizona; allotype, male, Tucson, Arizona, in United States National Museum, *ex* collection Barnes.

DISTRIBUTION: So far known only from the type localities in southern Arizona.

GROUP III

This group and all the following ones differ from the species in group II in lacking the heavy chitinization of the transtilla processes. Two species (*albifasciata* Packard and *cochiseata* Swett) are included here on account of the great similarity of their genitalia; in both species also the palpi are extremely short.

The main male genitalic characteristics are as follows: A short stubby uncus, the apical edge of which is slightly bifid, owing to very short lateral projections; a strong chitinized strip along the costa of the clasper, the apex of which projects well beyond the margin of the valvula and shows a semicircular excavation of its lateral edge; very strong chitinous ribbons from costobasal tubercles I and II, the ribbon from tubercle II being recurved at its base and showing a small rounded projection shortly before its apex; juxta plate with its basal half thin and upright, apical section broadly expanded, with apices reinforced on their inner sides by chitinous strips which show rounded projections; aedeagus armed apically with chitinous hooks or spines;

rounded ends of the vinculum not contiguous on dorsal side, joined ventrally by a curved plate. The female genitalia possess a chitinized semicircular genital plate with large rounded ostium; there is no half collar; the ductus bursae is long and weakly chitinized; the bursa is projected caudad along the left side of the ductus for a considerable distance. Further details can be found in the discussion of the individual species.

Hydriomena albifasciata albifasciata Packard

Text figures 94, 95, 174

Hypsipetes albifasciata PACKARD, 1874, Sixth Rept. Peabody Acad. Sci., p. 41; 1874, Proc. Boston Soc. Nat. Hist., vol. 16, p. 40, pl. 1, fig. 5.

Hydriomena sordidata var. *albifasciata*, PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 98, pl. 8, fig. 34.

Hydriomena furcata var. *albifasciata*, SWETT, 1911, Canadian Ent., vol. 43, p. 77.

Hydriomena albifasciata, TAYLOR, 1907, Ent. News, vol. 18, p. 310. BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1,

p. 10, pl. 1, fig. 10. SWETT, 1918, Canadian Ent., vol. 50, p. 293.

Hydriomena furcata var. *resecta* SWETT, 1910, Canadian Ent., vol. 42, p. 282; 1911, *ibid.*, vol. 43, p. 76.

Hydriomena albifasciata form *resecta*, BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 10. SWETT, 1918, Canadian Ent., vol. 50, p. 293.

Hydriomena albifasciata form *puncticaudata* BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 11, pl. 1, fig. 11.

Hydriomena albifasciata form *beldenae* GUEDET, 1941, Pan-Pacific Ent., vol. 17, p. 191.

The species is one of the more common species of very early spring on the Pacific coast, extending from Vancouver Island, British Columbia, in the north where it has subspecific character, to the extreme southern counties of California in the United States. It is extremely variable in both coloration and maculation of the primaries and is only surpassed in this respect by another early spring species, *nubilofasciata*. The nimotypical California subspecies with its white postmedian band has been illustrated by Packard and is also figured in the 1917 revision. This pale band varies greatly in width and distinctness. In a long series of specimens in the Sperry collection from Laytonville, Mendocino County, individuals occur in which the band is clear white. In others it is somewhat obscured by central smoky shading, and a few specimens show a distinct ruddy suffusion over the whole area. In width the band may appear quite broad, with a strong outward bulge at veins 3 and 4, or it may become narrowed, with a corresponding reduction of the bulge. In extreme cases it may break up into isolated spots as it approaches the inner margin of the wing. The banded form appears to be the predominant one in this area, but the series contains also specimens of the suffused type to which, in a general sort of way, the name *puncticaudata* may be applied. They are not quite typical, being too large in size and showing none of the "dull olive green" suffusion mentioned in the original description which was based on specimens from the San Francisco Bay area. An occasional specimen was found to be tinged with a ruddy brown suffusion and might therefore be classed as *resecta*, a very dubious name at the best, as such suf-

sion occurs infrequently in many of the multitudinous forms into which the species breaks up. With further regard to *resecta*, the original description states that the type male is in the Swett collection and the female with Mr. Broadwell, whose collection later was incorporated in that of the American Museum of Natural History. Correspondence elicits the fact that this latter specimen, labeled "Type" in Swett's handwriting, is a male, and as the entire type material obviously came from Mr. Broadwell, it seems only proper to designate this specimen as the lectoholotype. It should be further noted that the types bear the same faulty data as were found and remarked on in the type series of *edenata*. Both lots obviously originated from the same unknown source, and the dates of capture (June) should be regarded as erroneous. The recently described form *beldenae* is based on specimens in which the white submarginal spot of the primaries is extended in both directions to form a partial band. This is purely an individual occurrence, and the name is scarcely worth retaining. Dozens of names could be proposed for such minor variations in the series before the author, but he has no intention of cluttering up the catalogue with such unnecessary terms.

In the counties of what may be roughly termed the San Francisco Bay area (Napa, Sonoma, Marin, Contra Costa, Santa Clara, Santa Cruz) the nimotypical form is apparently rare, and the specimens themselves are rather smaller in size. The type material of *puncticaudata* originated largely in Sonoma and Contra Costa counties and has not been examined of recent years by the author; the figure in the 1917 revision of a paratype should, however, give a good idea of the character of the maculation. In the material under examination from this area only the odd specimen shows the typical olive-green suffusion; a specimen in the Canadian National Collection from Spring Mountain, Napa County, January 26, comes closest to the description in this respect. Most of the other specimens show an extremely heavy suffusion of a deep smoky brown, obscuring almost entirely the maculation, with the exception of the white submarginal spot; in some cases, however, this suffusion is less heavy and some traces of the paler postmedian band are visible.

Judging by a few specimens submitted by

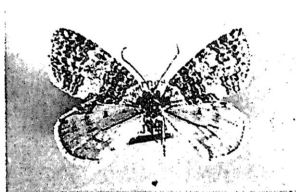
the Los Angeles County Museum, the species is quite small in size in the southern coastal counties of California (Riverside, Los Angeles) and on the Channel Islands. No specimens with the white band have been seen from this region, the postmedian area, although somewhat paler than the surrounding areas, being suffused with a light brown; the white subterminal spot is quite minute. Whether a good subspecies is represented in this area cannot be determined at present from the scanty material and the poor condition of most of the specimens. Another interesting series was found in the same collection, consisting of six males taken in the Yosemite Valley at 4000 feet altitude on March 15; one of these speci-

mens was a typical *albifasciata*; the other five would fall under the form name, *puncticaudata*, although somewhat paler and grayer than specimens from the coast. Apart from a single male in the author's collection from Lake Almanon, Plumas County, which bears the rather extraordinary date "Aug. 25, 1930 (M. L. Walton)," no other specimens from the region of the Sierras have been seen, but it is evident that the species is not entirely confined to the coastal regions although predominant there.

The palpi are very short, scarcely projecting beyond the front, and the male antennae are thin, only slightly compressed laterally and with the ventral edge faintly serrate.

PLATE 3

1. *Hydriomena feminata* McDunnough, female, holotype, Inverness, Marin County, California (Canadian National Collection).
2. *Hydriomena albimontanata* McDunnough, female, allotype, White Mountains, Arizona (Canadian National Collection).
3. *Hydriomena ruberata* Freyer, male, typical, Mt. Uniacke, Nova Scotia.
4. *Hydriomena ruberata* form *variegata* Prout, male, Aldershot, Kings County, Nova Scotia.
5. *Hydriomena ruberata pallula* McDunnough, male, Bishop Creek, Inyo County, California (Los Angeles County Museum).
- 6-7. *Hydriomena macdunnoughi* Swett. 6. Male, Nordegg, Alberta (Canadian National Collection).
7. Male, pale specimen, Nordegg, Alberta (Canadian National Collection).
- 8-9. *Hydriomena furcata fergusonii* McDunnough. 8. Male, holotype, Peggy's Cove, Halifax County, Nova Scotia (Canadian National Collection). 9. Female, allotype, Peggy's Cove, Halifax County, Nova Scotia (Canadian National Collection).
10. *Hydriomena clarki* Wright, male, holotype, Santa Catalina Mountains, Arizona (the American Museum of Natural History).
11. *Hydriomena morosata* form *gravis* McDunnough, male, holotype, Alpine, White Mountains, Arizona (Canadian National Collection).
12. *Hydriomena edenata prasinata* McDunnough, male, holotype, Inverness, Marin County, California (Canadian National Collection).
13. *Hydriomena irata lolata* McDunnough, male, holotype, Mt. Lolo, Kamloops, British Columbia (Canadian National Collection).
14. *Hydriomena rita* McDunnough, male, paratype, Madera Canyon, Santa Rita Mountains, Arizona (collection Sperry).
15. *Hydriomena charlestonia* McDunnough, male, holotype, Sawmill Spring, Charleston Mountains, Nevada (collection Sperry).
16. *Hydriomena johnstoni* McDunnough, male, holotype, Inverness, Marin County, California (collection Sperry).
17. *Hydriomena bryanti* McDunnough, male, holotype, Santa Catalina Mountains, Arizona (Canadian National Collection).
- 18-19. *Hydriomena catalinata* McDunnough. 18. Male, holotype, Santa Catalina Mountains, Arizona (Canadian National Collection). 19. Female, allotype, Santa Catalina Mountains, Arizona (Canadian National Collection).
20. *Hydriomena ruberata pallula* McDunnough, male, holotype, Leavening, Mono County, California (Canadian National Collection).
21. *Hydriomena gracillima* McDunnough, male, holotype, Barfoot Park, Chiricahua Mountains, Arizona (Canadian National Collection).



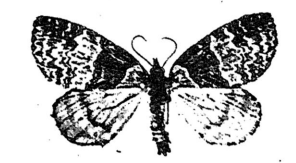
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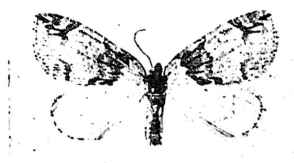
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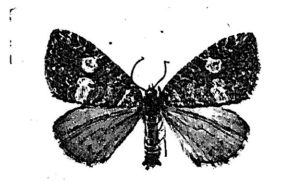
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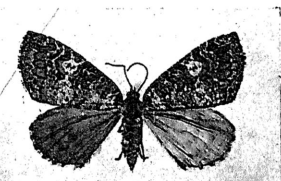
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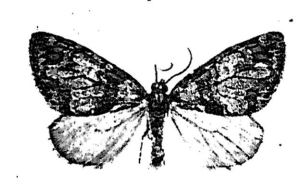
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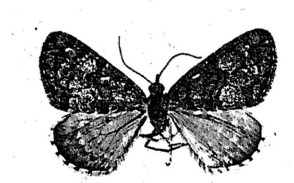
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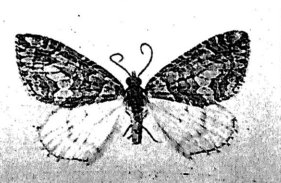
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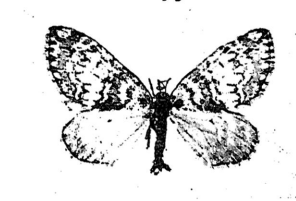
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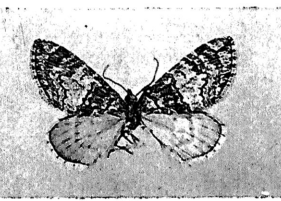
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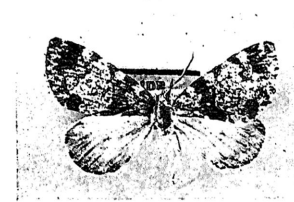
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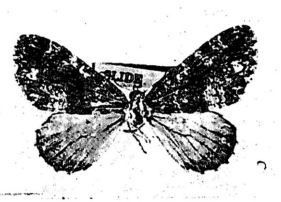
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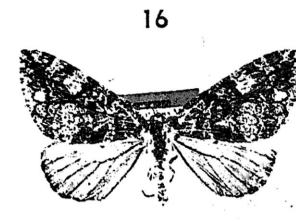
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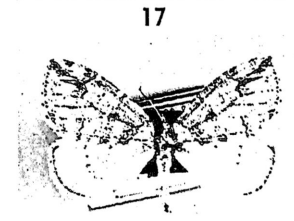
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MALE GENITALIA: Uncus simple, broad at base, narrowing to a short thick rod, the apices of which bend ventrad and are very weakly bifid. Tegumen rounded apically, the sides convex and gradually expanding to base, bent inward quite considerably on the ventral side, with short inward projections at their broadest point; dorsally a median septum divides the area into two large subdivisions; the cephalic edge shows a deep, triangular, median indentation. Transtilla processes short, somewhat blade shaped, narrowed apically and bent slightly inward, clothed with short scattered setae. Clasper narrow, sacculus weakly chitinized, valvula narrow; costal edge with a strong broad band of chitin which projects well beyond the edge of the valvula, the projected portion curving inward and sharply narrowed apically by a rounded excavation on the dorsal edge, terminating bluntly. Both costobasal tubercles present, arising from the dorsal side of a chitinous bar that projects over costa; tubercle I with a broad chitinous ribbon which is directed obliquely dorsad in its basal section, then curves ventrad, narrows somewhat, and terminates in a small hook; tubercle II gives rise to a single, strong, chitinized ribbon which is recurved at its base, forming a large loop across the dorsal side of the clasper, then bends ventrad; shortly before its apex it bears a characteristic lateral projection, the balance of the apical section being thin, sinuate, and rounded terminally; very weak tufts of simple hairs arise apicad of tubercle II. Juxta plate with a rather narrow stalk-like base, expanding strongly in the apical two-thirds, with lateral edges very poorly defined; apically the inner sides of the projections are more strongly chitinized and show irregular raised edges; a very broad, thinly chitinized, marginal band borders each side, giving a much broader appearance to the plate; the base is very finely spiculate; long setae occur at scattered intervals on the lateral sections of the plate. Anellus very finely spiculate. Aedeagus rather short and thick, broadening slightly apically; the sides are strongly chitinized distally, especially the left side which at times projects as a blunt hook; there is a central, sharp, terminal spine on a lengthened base; the vesica contains a curved band of short spines, tapering apically.

FEMALE GENITALIA: Genital plate broad,

hemispherical, well chitinized, surrounded by an amorphous mass that is indissoluble in caustic potash. Ostium situated medially on the caudal margin of plate as a large semicircular opening, leading into a short, well-chitinized, funnel-shaped tube which reaches practically to the cephalic margin of plate but does not project beyond it; the sides are raised centrally and terminate in a small, median, rounded projection. The following ductus bursae is weakly chitinized, especially proximally, and rather irregular in outline; it forms a long tube, fairly broad at its inception and gradually broadening distally; the left side is straight, but the right side shows a proximal bulge followed by a slight hollow, after which it is strongly convex and rounded inward at the junction with the bursa; the ductus seminalis arises from a membranous sac on the right side at the extreme proximal edge. Bursa oval, thin, membranous, sending a large projection caudad along the left side of the ductus.

TYPES: Holotype, female, California, in Museum of Comparative Zoölogy. Form *resecta*, holotype, male, Eden Vale, Monterey County, California, June (*sic*), in the American Museum of Natural History, *ex* Broadwell collection; paratypes, same data, in Museum of Comparative Zoölogy, Harvard College, and Carnegie Museum, Pittsburgh, *ex* Marloff collection. Form *puncticaudata*, holotype, male, allotype, female, and three paratypes, Eldridge, Sonoma County, Oakland, Contra Costa County, and Alma, Santa Clara County, California, in United States National Museum. Form *beldenae*, holotype, male, Glen Ellen, Sonoma County, California, February 8, 1941, No. 5186, in California Academy of Sciences. Paratype, male, same data, in the American Museum of Natural History.

DISTRIBUTION: According to available records, the nymotypical subspecies is largely coastal in California, extending from Mendocino County southward to Riverside and Los Angeles counties. It is, however, not entirely confined to the coastal counties, as a small series is known from the Yosemite Valley (Camp Cascades, 4000 feet) and a single doubtful specimen is recorded from Plumas County (Lake Almanon). No records have been noted from counties north of Mendocino County nor from the adjacent states of Oregon and Washington.

Hydriomena albifasciata victoria Barnes
and McDunnough

Hydriomena albifasciata var. *victoria* BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 11, pl. 1, figs. 12, 15, pl. 7, fig. 3 (genitalia).

A small series of four males and four females in the Canadian National Collection have been the only specimens studied. These were all captured at Victoria, Vancouver Island, in late February, with the exception of a single male from Duncan, farther up the island; they match the figures of the types given in the revision excellently. The females show more clearly the dull olive-green ground color of the primaries than do the males, and the pale postmedian band is also better defined and contains more whitish scaling. Very little variation in either coloration or maculation can be noted. The genitalia agree with those of the nimotypical form.

TYPES: Holotype, male, allotype, female, and two male and one female paratypes, Victoria, British Columbia, March 20, April 12, 19, 29, in United States National Museum, *ex* collection Barnes.

DISTRIBUTION: Known only from the southern portion of Vancouver Island (Duncan, Victoria).

Hydriomena albifasciata reflata Grote

Hydriomene Reolata (*sic*) GROTE, 1882, Canadian Ent., vol. 14, p. 186. TAYLOR, 1907, Ent. News, vol. 18, p. 311. SWETT, 1911, Canadian Ent., vol. 43, p. 78; 1918, *ibid.*, vol. 50, p. 294.

Mesoleuca abacta HULST, 1898, Canadian Ent., vol. 30, p. 117. GROSSBECK, 1907, Trans. Amer. Ent. Soc., vol. 33, p. 339 (synonymy).

Hydriomena albifasciata var. *reflata*, BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 11, pl. 1, figs. 13, 14, pl. 7, fig. 4 (genitalia).

Virtually no material of this Arizona race of *albifasciata* has been available for study. The Barnes collection evidently contained a good series of specimens, mostly from Palmerlee, Cochise County, Arizona, collected in March, and the two specimens figured in the 1917 revision give an adequate idea of the type of maculation. From a single male in the Canadian National Collection which originally came from the Barnes collection a geni-

tal slide has been made and found to agree in all essential details with the nimotypical form.

TYPES: Holotype, male, allotype, female, Arizona (presumably in United States National Museum, *ex* collection Brooklyn Institute of Arts and Sciences). *Hydriomena abacta*, holotype, sex unknown, Arizona (Rutgers University, New Brunswick, New Jersey). A paratype is in the United States National Museum.

DISTRIBUTION: Southern Arizona; known chiefly from Cochise County.

Hydriomena cochiseata Swett

Text figures 96, 175

Hydriomena cochiseata SWETT, 1909, Canadian Ent., vol. 41, p. 230; 1911, *ibid.*, vol. 43, p. 80.

Hydriomena cochiseata (*sic*), BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 11, pl. 2, figs. 1, 2, pl. 7, fig. 5 (genitalia).

Hydriomena cochiseata form *swetti* BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 12, pl. 2, fig. 3.

The two male types from Palmerlee, Arizona, on which the name was based are now in the American Museum of Natural History, *ex* Broadwell collection. The name was restricted in the 1917 revision to the specimen with smoky gray suffusion over the wing, and the holotype will become that one of the two specimens which agrees with this characterization. For the rare white-banded form, which one of the types represents, the name *swetti* was proposed in 1917 and the holotype figured. Although the Barnes collection evidently contained a long series of specimens, the species appears of late years to have been met with only occasionally by collectors in Arizona, possibly owing to its limited distribution and also to the early time of its appearance (January, February). Two worn females from Miami, Gila County, Arizona, March 20, have been examined in the Sperry collection. Otherwise any material seen apparently came originally from the Barnes collection and was taken at either Palmerlee or Redington, Arizona. These two places in all probability do not actually represent the type localities but were the homes of the collectors

from whom Barnes purchased his material. This was most likely taken in some of the near-by mountain ranges, but in those days accurate locality data were unfortunately not considered as essential as they are at present.

There seems little necessity to add anything further to the information contained in the first revision. The figures of the adults and of the male genitalia should be sufficient to render accurate determination fairly easy.

MALE GENITALIA: Very similar to those of *albifasciata*. The uncus is somewhat chunkier apically but shows the same weakly bifid terminal construction. The tegumen is shorter, with less rounded sides; these are rather rigidly outwardly oblique, the whole section expanding very rapidly from apex to base; the inward chitinized projections are large and bluntly pointed apically; the dorsal triangular invagination of the cephalic margin is very deep and the subdivisions in consequence are much narrower. There is little difference in the size of the transtilla processes, and the clasper is also essentially the same, with only very slight modifications of the chitinized costal strip and the chitinous ribbons from tubercles I and II. The juxta plate is also similar in shape, the apical area being possibly slightly

broader than in *albifasciata*. The main difference occurs in the armature of the aedeagus; the strong chitinization of the lateral apical areas terminates on each side in a sharp hook; the central spine is more developed and broader, terminating in a large recurved hook; the aedeagus itself (fig. 96) is narrower in the proximal half, then irregularly broadened and bent ventrad.

FEMALE GENITALIA: Of the same general type of construction as in *albifasciata*; the ostium opening is very much broader, however, and the sides of the genital plate rather crenulate; the entrance to the ductus is narrow and rounded. The ductus bursae is much thinner and less heavily chitinized than that of *albifasciata*; it broadens only very slightly apically. The attachment of the bursae is much the same as in the allied species.

TYPES: Holotype, male, Palmerlee, Cochise County, Arizona, in the American Museum of Natural History, *ex* collection Broadwell. Form *swetti*, holotype, male, and paratype, male, Palmerlee, Arizona, in the United States National Museum, *ex* collection Barnes.

DISTRIBUTION: Southern Arizona (Gila County; Cochise County).

GROUP IV

The members of this group differ from those of the preceding group in the following main characteristics: the palpi are long and blade-like; in the male genitalia the uncus is thin and strap-like; in the clasper the chitinized costal strip projects very slightly beyond the valvula as a sharp point; the chitinous ribbons from costobasal tubercles are thinner and of more or less even width throughout, the ribbon from tubercle II being much less recurved at base and without any apical projection; the juxta plate is narrow and high, not greatly expanded apically; the aedeagus is long and unarmed; the vesica contains a cluster of long weak spines.

In the female genitalia there is no genital plate, the structure of the ostium being quite similar to that of members of group I; there is a chitinous half collar present; the

tube-like ductus bursae is bent ventrad at its distal end, forming a heart-shaped ring to which the bursa is attached; the bursa is large and heart shaped, the sides projecting roundedly caudad along the distal end of the ductus.

The above characteristics apply to the species *speciosata* Packard, *morosata* Barnes and McDunnough, and *barnesata* Swett. At the present time it seems best to include with them a fourth species, *cyriadoides* McDunnough, which differs in a number of genitalic details but which at least shows a strap-like uncus and an unarmed aedeagus with a cluster of cornuti in the vesica. In the female genitalia it possesses the same type of funnel-shaped ostium and chitinous half collar. This species was wrongly placed as *cyriades* Druce in the 1917 revision and is now re-

described. The relationship of the two is undoubtedly close, and a study of Mexican species will probably be necessary to determine their correct placement. Finally the recently described species, *sperryi* McDunnough, is added to the group on account of a certain similarity in the male genitalic characters, although the organ in the female sex is entirely divergent and quite unique.

Hydriomena speciosata Packard

Text figures 97-99, 176

Hypsipetes speciosata PACKARD, 1874, Proc. Boston Soc. Nat. Hist., vol. 16, p. 22.

Hydriomena speciosata, PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 102. SWETT, 1915, Canadian Ent., vol. 47, pp. 9, 63. BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 34, pl. 5, fig. 11.

Hydriomena speciosata var. *agassizi* Swett, 1910, Canadian Ent., vol. 42, p. 277 (pl. 8, fig. 37 of Packard, 1876); 1915, *ibid.*, vol. 47, pp. 10, 63.

Hydriomena speciosata var. *taylori* SWETT, 1910, Canadian Ent., vol. 42, p. 277; 1915, *ibid.*, vol. 47, pp. 10, 63. BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 48, pl. 5, fig. 12.

Hydriomena speciosata var. *ameliata* SWETT, 1915, Canadian Ent., vol. 47, p. 64. BLACKMORE, 1915, Ann. Rept. British Columbia Prov. Mus., p. 18, pl. 7, fig. 3 (holotype).

The name *speciosata* was originally based on two male specimens collected by A. Agassiz at Mendocino City, California, one of which was figured by Packard (1876, pl. 8, fig. 37). In 1910 Swett restricted the name to the specimen with "pale pea green" coloration, contending that the original description was based on such a specimen. For the darker form with broad black marginal area he proposed the varietal or, better, form name *agassizi*, the type being the specimen figured by Packard. Virtually no California material has been available for examination. Two specimens in the Bauer collection from Petaluma, Sonoma County, June 14, 1948 and Inverness, Marin County, April 19, 1947, were examined some time ago, and just recently a strongly melanic female from the type locality, Mendocino City, June 28, 1952, has been sent by the same collector for identi-

fication. This latter specimen is much more heavily suffused with black than the type of *agassizi*, the whole median area forming a broad blackish band; only traces of green remain in the subbasal and subterminal areas. It is, however, best placed under the form name *agassizi*.

Most of the material distributed under the name *speciosata* originated on Vancouver Island, British Columbia, where the species appears to be much more common than in California; the specimen figured in the 1917 revision (pl. 5, fig. 11) is regarded as typical. In such specimens the ground color is pale pea-green, with frequently considerable whitish shading in the postmedian band which follows line III, especially in the costal area; the cross lines and bands are deep purple-brown. Line IV may at times be obsolescent, leaving a very broad green band extending to band V. In worn specimens the green color fades to almost white.

Swett's so-called variety *ameliata* was based on two females captured by E. H. Blackmore in the vicinity of Victoria, British Columbia. The type was figured (see Blackmore, 1915, above) and is now in the collection of the University of British Columbia in Vancouver. Swett's description is difficult to follow, as he seems to have mixed the antemedian and postmedian areas under the same term, "mesial." As far as can be made out the name would apply to a form in which the postmedian band is entirely white. Apparently all manner of intergrades occur between the normal form and this extreme one, and the name is scarcely worth retaining.

Another of Swett's varietal forms from Vancouver Island was named *taylori*, and according to the author's remarks in 1915 (Canadian Ent., vol. 47, p. 10) "seems to be a color variety of *speciosata* in which the green and white is replaced by a brownish olive." The holotype male was collected by the Rev. G. W. Taylor at Departure Bay on Vancouver Island and is now in the Museum of Comparative Zoölogy, Harvard College, ex collection Swett. A cotype was stated to be in the collection of A. J. Croker, but the location of this collection, which contained several other of Swett's types, cannot be ascertained in spite of inquiries from various Vancouver Island collectors. The 1917 re-

vision figures a topotypical specimen (pl. 5, fig. 12) which originally belonged in the collection of Taylor, purchased on his death by Barnes. This figured specimen appears to show more whitish shading in the postmedian band than is indicated by the original description but is probably otherwise correct. The Canadian National Collection contains a very rubbed male from Victoria and a perfect female from Departure Bay in which the primaries are entirely suffused with light purplish brown with the exception of a white costal patch in the postmedian band and a thin border of white on the inner side of band V in the costal half of wing. A very similar female is in the author's collection taken by G. and J. Sperry at Rosemary Inn in the Olympic Mountains, Washington, together with normal males in which the green color appears to be a little deeper than in Vancouver Island specimens.

In all the above forms the palpi are long, porrect, and blade-like; the male antennae are extremely thin, hardly thicker than those of the female, and show less of the lateral compression than usual.

MALE GENITALIA: (Based on a specimen from Victoria, British Columbia, in the Canadian National Collection). Uncus simple, the base quite broad, narrowing sharply to a thin short rod, with rounded apex. Tegumen with convex sides, rounded apically and not strongly sloping to base; inward chitinous projections short and pointed; dorsal subdivisions much as in group I. Transtilla processes weak, thin, with scattered setae over their surfaces, the whole much as in group I. Clasper fairly broad at base, with a rather long but weakly chitinized sacculus; valvula rather small, not greatly expanded; ventral margin with invagination at base. Chitinized costal strip rather thin, terminating in a sharp point projecting slightly beyond the margin of the valvula; costobasal tubercles I and II both present, large, pointing dorsad and each giving rise to a strong, twisted, chitinous ribbon, that from I slightly hooked at apex, while the one from II is much twisted in the apical section and ends in a bent hook. A weak tuft of very slightly knobbed hairs arises apicad of tubercle II. Juxta plate high and narrow, expanding moderately from a very narrow, slightly stalked base with almost

rigidly oblique sides to rounded apices; a small raised ridge is formed by each lateral edge shortly before the apex; a very thinly chitinized, marginal band is present, broadest at base; this band extends beyond the rounded apices of the plate proper, forms slight lateral hooks, and sends a narrow strip of chitin on each side backward and inward on the under side of the plate proper; these bands practically meet in the central area of the plate and are continued to base by a single median chitinous bar. Vestiture of plate composed of a few, very thin, scattered setae with slight indication of the tufts below apices found usually in group I. Rounded ends of vinculum do not meet dorsally but on ventral side are joined by a rounded plate that is also attached to the bases of the clasper. Anellus very feebly spiculate. Aedeagus moderately stout and long, not much curved; vesica armed with a cluster of long thin spines, occupying nearly half of the length of the aedeagus.

FEMALE GENITALIA: (Based largely on Vancouver Island specimens). Ovipositor lobes short, broad, separated by a wide, V-shaped excision, sparsely covered with long setae; posterior apophyses rather short and thick. Ostium very weakly membranous, broad, funnel shaped, narrowing gradually to a thin short tube which terminates in a chitinous half collar. Ductus bursae thinly chitinized, long, broadening somewhat irregularly towards distal end, with convex right edge; at the entrance to the bursa it bends sharply ventrad, forming a more or less heart-shaped ring of variable shape to which the ends of the bursa are attached; ductus seminalis arises from a small membranous sac situated proximally on a slight bulge on the right ventral side of the ductus bursae. Bursa large, membranous, heart shaped, the proximal portion (when fully inflated) forming bulges directed caudad on each side of the ductus to form the characteristic heart shape.

TYPES: Holotype, male, Mendocino City, California, in Museum of Comparative Zoölogy. Form *agassizi*, holotype, male, Mendocino City, California, in Museum of Comparative Zoölogy. Form *taylori*, holotype, male, Departure Bay, Vancouver Island, British Columbia, July 22, 1908, in Museum of Comparative Zoölogy, *ex* collection Swett;

paratype, male, Victoria, British Columbia, July 1, 1909, in Croker collection, location unknown. Form *amelia*, holotype, female, Victoria, British Columbia, July 7, 1914, in collection of University of British Columbia, Vancouver, *ex* collection Blackmore; paratype, female, same locality, July 9, in Museum of Comparative Zoölogy, *ex* collection Swett.

DISTRIBUTION: Mendocino County (Mendocino City), Sonoma County (Petaluma), and Marin County (Inverness), California; Rosemary Inn, Lake Crescent, Olympic Mountains, Washington; Vancouver Island, British Columbia (Victoria and adjacent areas, Departure Bay, Ucluelet). No intermediate records are available.

LARVAL FOOD PLANTS: From bred material submitted by the Canadian Forest Insect Survey the following food plants have been noted: Douglas fir (*Pseudotsuga*), pine (*Pinus contorta*), hemlock (*Tsuga*), and balsam fir (*Abies*). Most of the specimens were typical; two were of the form *taylori*.

***Hydriomena morosata* Barnes and McDunnough, new status**

Text figures 100, 101

Hydriomena speciosata var. *morosata* BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 34, pl. 5, figs. 13, 14 (types).

Morosata was described as an Arizona race of *speciosata*; at the same time certain characters in the male genitalia were noted that did not quite coincide with those of *speciosata*, notably the shape of the uncus and the size of the patch of cornuti in the vesica. After a study of considerable material it has been found that such characters appear to be constant, and for this reason *morosata* is elevated to specific rank.

The figures of the male and female types given at the time of the original description are excellent. The general coloration of the primaries in the darker areas gives the impression of a light gray-brown, the postmedian area being rather broad, dull whitish in color, with a sprinkling of light brown. Particular attention is called to the shape of line I which is quite thin and forms a distinct outward angle below costa, after which it runs virtually perpendicular to the inner

margin. Band II is broad and sharply angled below costa but is not particularly obvious, being obscured by the dark shading of the antemedian area. Lines III and IV are thin, except at costa where they form small blotches, the latter line being distinctly dentate. Band V is broad in the costal half, then much narrowed to a mere line, and again broader above tornus; it shows frequently white spots or streaks on its inner margin opposite cell. The secondaries are a very light smoky, crossed by two dentate, postmedian, curved lines. All these characters can be observed in the above-mentioned figures. The male antennae are thin, scarcely stouter than those of the female; the palpi are long, porrect, and blade-like. Most of the material available for study was collected in the White Mountains region of Arizona in late June. The species, however, appears to extend northward through the Rocky Mountains as far as the province of Alberta. The Sperry collection contains a small series of males collected by Owen Bryant at Banff in July, 1925, and the Canadian National Collection possesses a single worn female from the Dod collection labeled "Calgary, Alta. Aug. 6, 1907." Two bred specimens submitted by the Canadian Forest Insect Survey bear the label "Commotion Creek, B. C.," a locality not on the maps or in the postal guide.

MALE GENITALIA: Very similar to those of *speciosata*. Uncus (fig. 100) thin, strap-like, slightly longer than that of *speciosata*. The sides of the somewhat broader and shorter base slope gradually inward to the strap-like portion, whereas in *speciosata* the base is broader and the sides are rather abruptly rounded. Tegumen less rounded apically, with rigidly oblique sides rather than the convex ones of *speciosata*. Transtilla processes much as in *speciosata*. Clasper also very similar, but the chitinous ribbons from tubercles I and II shorter, the ribbon from I showing a tendency to recurve across the entire ventral surface of the clasper. Juxta plate much the same, but the raised edges of the plate before apex less obvious. The ends of the vinculum on the dorsal side appear less rounded than those of *speciosata*. The main difference occurs in the aedeagus (fig. 101), the armature of the vesica consisting of a much smaller and decidedly shorter cluster of cornuti.

FEMALE GENITALIA: Apparently quite similar to those of *speciosata*. Ovipositor lobes thin, close together, separated by a very narrow incision; posterior apophyses thin and apparently somewhat longer than in *speciosata*. Owing to the thinly chitinated nature of the ductus bursae and its terminal ring, it is practically impossible to secure a slide in which these parts are in normal condition; they tend to twist and shrivel and form pleats and folds which render a close comparison impossible. Added to this only a single typical female (Greer Road, White Mountains, Arizona) from the Canadian National Collection was available for examination; in this the terminal ring appeared to be stouter than in *speciosata*, with broader edges, but this may be simply due to the position on the slide. In two other females which on maculation certainly would be placed as *morosata* (one simply labeled "Arizona," the other worn and taken by Dod at Calgary, Alberta) the above character is not borne out, each differing somewhat from each other and also from the White Mountains specimen. A great deal more material will be necessary for careful study before specific characters can be defined.

TYPES: Holotype, male, allotype, female, and five paratypes, Redington, Arizona, in United States National Museum. One male paratype, same data, in the American Museum of Natural History.

DISTRIBUTION: Southeastern Arizona [Redington, Pima County; White Mountains (Greer Road; Colters Ranch; south fork, Little Colorado River)], extending apparently northward through the Rocky Mountains to the Province of Alberta (Banff, Calgary).

LARVAL FOOD PLANT: *Pinus contorta*, according to the British Columbia specimens mentioned above.

***Hydriomena morosata* form *gravis*, new form**

Plate 3, figure 11

Together with typically colored *morosata*, a form occurs in the same localities and on the same dates which superficially is easily separated and which on first glance has all the appearance of a good species. However, in the genitalia, after a careful study of several slides, nothing could be found that could be used as a means of specific separation, the

two organs appearing similar in all respects. As far, therefore, as can be told at the present time it represents a mere form, but one which, in the author's opinion, should be named in order to prevent its being confused with *regulata* Pearsall, to which it bears considerable superficial resemblance.

As compared with typical *morosata* it differs in the rather even, deep purple-brown coloration of the primaries and the decidedly deep brown color of the secondaries. Line I (subbasal), which in *morosata* is thin and quite sharply angled, is much broader and deeper in color and shows only a slight tendency towards angulation. The balance of the maculation is as in *morosata* except that the lines and bands stand out less sharply, owing to the heavier suffusion. Traces of white markings may occur in the subterminal area as in *morosata* and, because of the darker ground color, show up quite prominently.

HOLOTYPE: Male, Alpine, Arizona, June 15, 1937 (G. and J. Sperry), in the Canadian National Collection.

ALLOTYPE: Female, Greer Road, White Mountains, Arizona, June 25, 1935, in same collection.

PARATYPES: Two males, same data as allotype, June 25, 27, in the Canadian National collection; two males and one female, same data as allotype, June 25, 27, in the Los Angeles County Museum; one male, same data, in collection Sperry; one male, White Mountains, Arizona, June 25, 1935 (G. and J. Sperry), and one male, Chiricahua Mountains, Arizona, May 31, 1934 (J. A. Comstock), in author's collection. Two males, south fork, Little Colorado River, White Mountains, Arizona, June 21, 24, 1947 (G. and J. Sperry); two females, same data but June 25, 28; one pair in the Sperry collection, the other pair in collection of the author.

***Hydriomena barnesata* Swett**

Text figures 102, 103, 177

Hydriomena barnesata SWETT, 1909, Canadian Ent., vol. 41, p. 229; 1915, *ibid.*, vol. 47, p. 11. BARNES AND MCDUNNOUGH, 1912, Contributions to the natural history of the Lepidoptera of North America, vol. 1, no. 4, p. 31, pl. 14, fig. 19 (holotype), fig. 22 (female); 1917, *op. cit.*, vol. 4, no. 1, p. 34, pl. 5, fig. 10, pl. 10, fig. 5 (genitalia).

There should be little difficulty in recognizing the species from the figures given. The holotype was evidently a rather small specimen, and it should be noted that both it and the female from Palmerlee figured at the same time (1912) show a rather pale antemedian area, with the dark band II distinctly visible. In the later figure (1917) of a male from Paradise, Arizona, a deep brown suffusion covers most of this area, and the band is obscured; such specimens occur quite commonly. The pale postmedian area also shows at times a considerable suffusion of light gray in which a white spot in the cell may stand out quite sharply. Most of the earlier Arizona specimens were taken in various localities of Cochise County, but a good series has been noted in the Sperry collection from Todd's Lodge, Oak Creek Canyon, captured in late June. Specimens from Fort Wingate, New Mexico, are also known, and the figure given of the female genitalia is from such a specimen in the American Museum of Natural History. The genitalia in both sexes show a close relationship to those of *speciosata*. The blade-like porrect palpi with their short, blunt, third joint are even somewhat longer than in *speciosata*, and the male antennae are considerably thicker.

MALE GENITALIA: (Based on a specimen from Oak Creek Canyon, Arizona). Uncus simple, very slightly swollen at base, then strap-like, long, and of even width throughout; apex rounded and only very slightly depressed. Tegumen slightly broader than uncus at their junction; sides then very evenly outwardly oblique to just before base where they make a slight convex bow; dorsal subdivisions much as in group I; inward chitinous projections near base short and blunt. Transstilla processes weak, short and broad at base, rather blade-like, with a few apical hairs. Clasper quite narrow, sacculus extending apicad farther than usual; very little invagination of ventral margin; chitinated strip along costa narrowed to a point which scarcely projects beyond edge of valvula; costobasal tubercles large, arising from a thin chitinous plate and pointing dorsad; strong chitinous ribbon from tubercle I somewhat twisted at base, then sickle-shaped, and terminating in a blunt point; tubercle II much larger than tubercle I, its single chitinous ribbon rather

thinner than the preceding one, strongly recurved at base, then twisted, especially towards its thinner apex. On the apical side of tubercle II a large tuft of long curved hairs arises, these hairs showing only the faintest traces of knobs. Juxta plate very high and narrow, broadening gradually from a thin base to apex, the sides being slightly sinuate; lateral apical projections weak and much as in group I; a weakly chitinated, thin, marginal band along the entire side; rounded projection beyond base weakly spiculate; vestiture of plate composed of thin, much scattered setae. Anellus very feebly spiculate. Aedeagus long and thin, bending ventrad towards apex; vesica armed with a cluster of thin, scattered, rather long cornuti, arranged more or less in two parallel rows. Vinculum narrow, gently rounded apically.

FEMALE GENITALIA: (Based on a specimen from Fort Wingate, New Mexico). Very similar in general characters to those of *speciosata*. The long funnel-shaped ostium shows weak spiculation in its proximal half, then narrows to a thin membranous tube, and is terminated by a weakly chitinated half collar. Ductus bursae a long chitinated tube, much narrower and more even than in *speciosata* but terminating in the same manner in a more or less heart-shaped ring that bends upward and to which the membranous bursa is attached. Bursa (in the present specimen) thinly membranous, globular. Most probably more strongly inflated specimens will show bulges directed caudad along the sides of the ductus as in the *speciosata* drawing. Ductus seminalis arising proximally from a small bulge on right side of ductus bursae.

TYPES: Holotype, male, and paratype, male, Huachuca Mountains, Arizona, in United States National Museum, *ex* collection Barnes. Paratype, male, in the American Museum of Natural History, *ex* collection Grossbeck.

DISTRIBUTION: Southwestern United States, New Mexico (Fort Wingate); Arizona (Huachuca Mountains; Palmerlee; Paradise, Cochise County; Oak Creek Canyon; Alpine, Apache County).

Hydriomena cyriadoides, new species

Text figures 104, 105, 178

Hydriomena cyriades BARNES AND McDUN-

NOUGH (*nec* Druce), 1916, Contributions to the natural history of the Lepidoptera of North America, vol. 3, no. 1, p. 23; 1917, *op. cit.*, vol. 4, no. 1, p. 35, pl. 6, fig. 8.

From a study of four specimens sent from the United States National Museum as representing the true *cyriades* and collected at Las Vegas, Vera Cruz, Mexico (collection Schaus), it has become evident that the male specimen from Tucson, Arizona, listed under this name represents a different species, although rather closely allied. Apart from its much smaller size, it differs in certain genitalic characters and also in points of forewing maculation. The above name is proposed for the species, and the following description has been drawn up from the male specimen in the United States National Museum and a female in the Canadian National Collection, the only two specimens known.

Male antennae thin, laterally compressed. Palpi quite long, porrect, black-brown. Head and collar pale whitish green, with dark transverse band anterior to base of antennae. Thorax mixed greenish and brown (too rubbed to define). Primaries pale whitish green, maculate with deep black-brown. A small dark dot at extreme base, followed closely by a narrow dark band, broadest at costa and not quite attaining inner margin. A thin dark subbasal line, corresponding to line I of the usual *Hydriomena* pattern, and forming an outward angle in the cell. This is followed by a rectangular dark costal patch, continued brokenly across wing by slight purplish brown suffusion. A third, somewhat smaller, costal patch occupies the median costal area. About halfway between this patch and the apex of the wing a small, outwardly oblique, triangular patch followed by a dark streak opposite the cell represents all that is left of line IV. The inception of band V on the costa is represented by a broad outwardly oblique band of purplish, bordered with black, extending as far as vein 6; it is then broken by the ground color and only continued by a narrower upright band of the same color, reaching from vein 2 to the tornus. At the wing apex is a dark blotch connected with the preceding band by a narrow dark line along vein 6. A series of geminate dark patches along outer margin followed by a very thin dark marginal line.

Fringes smoky in basal half, paler outwardly, slightly checkered. Secondaries whitish, faintly suffused along inner area with smoky and showing faint traces of a paler, angled, postmedian line; fringes lightly checkered. Beneath pale smoky, with the costal maculation of upper side of primaries repeated; secondaries with faint smoky postmedian and subterminal lines. Expanse 20 mm.

MALE GENITALIA: Very similar to those of *cyriades* but smaller and much less heavily chitinized. Uncus simple, thin, strap-like. Tegumen short, broad, without shoulder; inward chitinous projections weak, narrow, and downcurved. Transtilla processes membranous, rather short and thin. Clasper normal, with little invagination of the ventral edge; chitinized costal strip not extending beyond valvula and narrowed apically; costobasal tubercles I and II well developed and conical, each with a single thin chitinous ribbon arising from apex; these ribbons are much twisted in their initial section and terminate with hooked apices; a small tuft of fine hairs arises apicad of tubercle II but none show knobbed apices. Juxta plate shorter than that of *cyriades* but broader apically and with a very deep median excavation, more or less U-shaped; sides irregularly sinuate, tapering to a narrow stalked base, the rounded projection of which is finely spiculate; only a few scattered hairs comprise the vestiture of the plate; broad, weakly chitinized, marginal bands extend along the entire lateral edges of the plate. Vinculum broadly rounded apically. Anellus feebly spiculate. Aedeagus thin, with a cluster of weak, rather scattered cornuti in the vesica.

FEMALE GENITALIA: Very fragile and almost wholly membranous. Ostium membranous, funnel shaped, rather short, terminating in a weakly chitinized half collar. Ductus bursae a long narrow membranous tube of practically equal width throughout, with the ductus seminalis arising dorsally from its proximal end. Entrance to the bursa centrally at its proximal end. Bursa thinly membranous, oval.

HOLOTYPE: Male, Tucson, Arizona, in the United States National Museum, *ex* collection Barnes.

ALLOTYPE: Female, Rustler Park, Chiricahua Mountains, Cochise County, 9000

feet, July 15, 1927 (J. H. Kusche), in the Canadian National Collection.

***Hydriomena sperryi* McDunnough**

Hydriomena sperryi McDUNNOUGH, 1952, Amer. Mus. Novitates, no. 1592, p. 1, fig. 4 (holotype), fig. 20 (genitalia).

Nothing much can be added to the information contained in the original description. In the description of the unique female genitalia the membranous tube between the ostium and the chitinous half collar was designated as the ductus bursae. However, following the

nomenclature used in the present revision, this section would appear to be merely a neck-like extension of the ostium, and the true ductus bursae would be the chitinized section distad of the collar and from which the ductus seminalis arises on the proximal left side.

TYPES: Holotype, female, and allotype, male, Miami, Gila County, Arizona, March 25, 1947 (L. H. Bridwell), in the American Museum of Natural History. Paratype, male, same data, in collection Sperry.

DISTRIBUTION: Known only from Gila County, Arizona.

GROUP V

The two Arizona species *bryanti* McDunnough and *clarki* Wright are placed in this group on account of the great similarity of their male genitalia; the female genitalia are known only in the case of *bryanti*. The affinities of these species are probably with those of the preceding group but in both the palpi are short, in the case of *bryanti* extremely so; the male antennae are also considerably thicker and more laterally compressed. In the genitalia the more or less similar type of simple strap-like uncus is present, but in the two above species the apex is somewhat bulbous. In the clasper the costal strip projects far beyond the edge of the valvula and terminates in a sharp bent hook; the costobasal tubercles show less of a dorsad direction, and their chitinous ribbons are less twisted basally and more evenly sickle shaped; the juxta plate is narrow, with a very deep apical excavation, the sides of which may be strongly chitinized; the vinculum is very broadly rounded apically; the most characteristic difference is in the aedeagus which is armed with one long spine and a series of shorter ones adjacent to it. In the case of *bryanti* the female genitalia are rather simple. There is a weak, subtriangular, genital plate from which the ostium arises on the caudal edge as a membranous tube of moderate width, continued by the ductus bursae with scarcely any alteration of width but with weak chitinization; this ductus is fairly long and enters a more or less oval bursa at its medio-proximal end.

***Hydriomena bryanti* McDunnough**

Plate 3, figure 17; text figures 106, 107, 179

Hydriomena bryanti McDUNNOUGH, 1943, Canadian Ent., vol. 75, p. 217.

Apart from the two males in the type series, two other males in the Sperry collection have been examined. These came originally from the same source as the type specimens but were unfortunately without locality labels, although it may be presupposed that they were collected in the same general locality by Owen Bryant; one of these specimens is now in the author's collection. Just recently two additional males from the collection of the California Academy of Sciences have been received for identification through W. Bauer. They are in beautiful condition, with the green coloration much brighter and the dark purple-brown banding standing out very strikingly. These specimens were collected on August 18, 1952, at Hospital Flat, Graham Mountains, Graham County, Arizona, by H. Leech, a locality not very far removed from the type locality. The female sex is represented by a single specimen in the American Museum of Natural History from Pinecrest, Graham Mountains, Arizona. The above specimens are the only ones at present known.

MALE GENITALIA: Uncus long, thin, and strap-like, with a short broader base and a rounded, somewhat bulbous apex, clothed with short scattered setae. Tegumen short and narrow, the apex rounded, and the

sides weakly convex, with rather strong inward chitinous projection near base, pointed apically; dorsal subdivisions much as in group I, very narrow. Transtilla processes short and chunky, with the usual scattered setae. Clasper rather narrow; sacculus long and weakly chitinized; valvula not so broad as usual; costal margin strongly and broadly chitinized, projecting well beyond edge of valvula and terminating in an incurving hook; costobasal tubercles present and directed dorsad; tubercle I large, tubercle II unusually small, both giving rise to single thin, chitinous ribbons, directed dorsad at the commencement and then curving ventrad, sickle shaped, and terminating in small hooks. Juxta plate high, narrow at base, expanding considerably apically, with a deep, rounded, medio-apical excavation, the sides of which are strongly chitinized and form short, rounded, apical projections beyond the plane of the plate proper; the base of the plate is formed by two small rounded lobes, separated in the median area by a short rounded invagination of their cephalic margins; the sides of the plate arise centrally from the lobes; there is apparently no thin marginal band and there are only a very few scattered setae in the apical portion of the plate. The vinculum is very broadly rounded apically, and the lateral ends are joined and not separated as in groups III and IV. The anellus is very feebly spiculate. The aedeagus is long, somewhat narrower in the proximal portion, bent slightly ventrad towards apex; it is armed with a single, long, strong spine and a cluster of about eight shorter spines, forming a compact group adjacent to the large spine along its apical section, the individual spines gradually diminishing in length as they approach the apex.

FEMALE GENITALIA: Comparatively simple. From the center of the caudal margin of a weak, subtriangular, genital plate the ostium arises as a moderately wide, membranous tube, continuing to slightly beyond the cephalic margin of the plate and joining with little change in width a very weakly chitinized, upright ductus bursae which narrows very slightly to enter the medio-proximal end of a membranous bursa which is fairly large, more or less oval in character with a slight bend distally to the left. The position

of the ductus seminalis could not be determined.

TYPES: Holotype, male, Santa Catalina Mountains, Arizona, August 22, 1938 (Bryant Lot 21), in the Canadian National Collection. Paratype, male, Arizona (O. Bryant), in same collection.

DISTRIBUTION: Southern Arizona (Santa Catalina Mountains; Graham Mountains).

***Hydriomena clarki* Wright**

Plate 3, figure 10; text figures 108, 109

Hydriomena clarki WRIGHT, 1920, Bull. Amer. Mus. Nat. Hist., vol. 42, p. 485. MCDUNNOUGH, 1943, Canadian Ent., vol. 75, p. 218.

Apart from the type series from Bear Wallow, Santa Catalina Mountains, Arizona, altitude 8000 feet, only the two male specimens in the Canadian National Collection from the same mountain range are known. The short palpi and the general brownish suffusion of the primaries in which the darker, more smoky colored, antemedian band is the only noticeable feature are characteristic of the species. The genitalia ally the species with *bryanti*.

MALE GENITALIA: (Based on a topotypical specimen in the Canadian National Collection). Very closely related to *bryanti*. The uncus somewhat thinner and longer, the tegumen considerably broader basally, the transtilla processes shorter and thinner. The clasper essentially the same, but the costal projection beyond the valvula bent outward at almost right angles shortly before its apex; the chitinous ribbons from tubercles I and II are considerably thicker. Juxta plate very weakly chitinized and indistinctly outlined, but in general of much the same shape as in *bryanti*; the sides of the apical excavation bend outward, however, much more sharply. Vinculum very similar in shape. The main difference is found in the aedeagus which is much broader than that of *bryanti*; it possesses the same single long spine, but the cluster of eight to 10 shorter adjacent spines is reduced to three, more widely separated, and diminishing in length in the same manner towards apex of organ.

FEMALE GENITALIA: Unknown.

TYPES: Holotype, male, and three male paratypes, Bear Wallow, Santa Catalina

Mountains, Arizona, August 17-19, 1916, latitude 31° 58' N., longitude 111° 29' W., about 3500 feet, in the American Museum of Natural History. Two other male paratypes were mentioned in the original description, one from the same locality as the type, the

other, worn, from Sabino Basin, August 15-21. These were probably retained by the describer and may now be in the collection of the San Diego Museum.

DISTRIBUTION: Southern Arizona (Santa Catalina Mountains).

GROUP VI

Two species which show no close affinity in their male genital organs either to each other or to species of any of the other groups are included tentatively in this group for lack of a better place to put them. In maculation of primaries they show a certain amount of similarity both to each other and to *speciosata* but, without knowledge of the female genitalia, it is impossible to determine whether such similarity shows any specific relationship or not. It is most likely that a study of Mexican hydriomenas will be necessary before they can be correctly placed. The two species are *magnificata* Taylor and *gracillima* McDunnough, and their male genitalic characters are dealt with under the specific headings.

Hydriomena magnificata Taylor

Text figures 110, 111

Hydriomena magnificata TAYLOR, 1906, Ent. News, vol. 17, p. 189. SWETT, 1912, Canadian Ent., vol. 44, p. 229. BARNES AND McDUNNOUGH, 1912, Canadian Ent., vol. 44, p. 274; 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 36, pl. 6, fig. 9.

Very few specimens of this large handsome species are known, and only a single male from the Sperry collection has been available for study. The large size and the figure given in the 1917 revision (pl. 6, fig. 9) should render a correct determination quite easy. The species flies in early spring.

MALE GENITALIA: (Based on a specimen in the Sperry collection from the Huachuca Mountains, Arizona). Uncus with broad base strongly setose, especially in median area, and convex sides; this is followed by a short narrow neck, expanding into a long, spoon-shaped, apical section, covered with long setae on its ventral side. Tegumen short, rounded

apically, the sides slightly convex and bent inward on the ventral side in the basal section; the usual inward projection is short and pointed; dorsally the cephalic margin shows a deep U-shaped excavation. Transtilla processes short and quite strongly setose. Clasper thin, with sinuate ventral edge and little expansion of the valvula; costa with strong chitinous band terminating in a sharp point extending beyond the margin of the valvula; costobasal tubercles well developed, covering base of costa, each giving rise to a single rather short, chitinous ribbon; tufts of simple long hairs partially cover the basal area. Juxta plate high and narrow, urn shaped, with somewhat stalked base and slight apical projections, the whole rather heavily covered with fine long setae; a very thin, broad, marginal band extends along the entire length of the plate. Anellus weakly spiculate. Aedeagus of moderate length, chunky, and apparently entirely unarmed. Vinculum with broadly rounded apical section.

FEMALE GENITALIA: Not available for examination.

TYPE: Holotype, female, Cochise County, Arizona, in United States National Museum, *ex* collections Taylor and Barnes.

DISTRIBUTION: Southeastern Arizona (Huachuca Mountains; Palmerlee, Cochise County).

Hydriomena gracillima McDunnough

Plate 3, figure 21; text figures 112, 113

Hydriomena gracillima McDUNNOUGH, 1944, Canadian Ent., vol. 76, p. 173.

The three specimens representing the type series are the only ones known to exist. The species is easily recognized by the pale salmon-colored hind wings. The maculation of the forewings bears a slight resemblance

to that of *speciosata*, but the male genitalia are strikingly different and appear to have little relationship to any species of the southwestern United States. The illustration given will show better than any description the salient points of the maculation.

MALE GENITALIA: (Based on a paratype in the Los Angeles County Museum.) Uncus with long narrow neck, expanding apically to form a broad, mushroom-like terminal section, with rounded caudal margin and numerous thin setae on ventral side. Tegumen rounded apically, very broad, with strongly convex lateral edges and short, pointed, inward projections near base; dorsally the cephalic edge shows a very deep excavation, pointed apically. Transtilla processes short and chunky, rather strongly setose. Clasper quite narrow; sacculus very weakly chitinized, valvula little expanded; ventral edge slightly emarginate at base of valvula; costal edge with the usual chitinized band, extending as a sharp point beyond the edge of the valvula; costobasal tubercles small and subequal, giving rise to single, very thin and short chitinous ribbons, the ribbon from tubercle II especially reduced in size; a strong tuft of knobbed hairs arises apicad of tubercle II, partially concealing the ribbons. Juxta plate

weakly chitinized, with lateral edges poorly defined; base narrow and stalk-like, the sides expanding gradually and terminating in short rounded projections with vestiture of thin scattered setae; the medio-apical section shows a strong, broadly U-shaped excavation; a broad, thinly chitinized, marginal band extends with convex edges from base of plate to the bases of the apical projections; a very few scattered setae occur on the basal half of the plate; the rounded projection from base of plate is weakly spiculate. Anellus very finely spiculate. Vinculum with the rounded terminations of its sides free dorsally but joined ventrally by a narrow curved plate of chitin. Aedeagus long and thin, slightly bent ventrad in its apical half; vesica with a strong cluster of thin, closely approximate cornuti, this cluster broadest in its basal area and tapering apically almost to a point.

FEMALE GENITALIA: Unknown.

TYPES: Holotype, male, Barfoot Park, Chiricahua Mountains, Arizona, May 23, 1934 (G. and J. Sperry), in the Canadian National Collection. Two male paratypes with similar data, one each in collection Sperry and the Los Angeles County Museum.

DISTRIBUTION: Known only from the type locality in eastern Cochise County, Arizona.

GROUP VII

On account of the great similarity of the female genitalia of *regulata* and *furculoides*, these two species are included in the present group, although nothing so far is known of the male sex of the former species. Both species possess a highly chitinized and very complicated structure of the genital plates; these differ from one another in the finer details but both agree in possessing a terminal projection on the left side ending in a strong curved spine and a bar-like projection on the corresponding right side; in both cases the bursa is small, membranous, and globular.

Owing to the similarity of the female genital organs, it would not be surprising if the male organ of *regulata*, when known, is found to be very similar to that of *furculoides*. In this species the uncus possesses a long thin neck followed by two long, apical forks,

this bifurcate character making it the only species which resembles species placed in group I but which on other characters shows no points of similarity. In the clasper the chitinized costa projects shortly beyond the valvula as a sharp point; there is also only a single costobasal tubercle with twisted chitinous ribbon. The anellus is very heavily spined, and the aedeagus broadens apically, containing clusters of strong spines in an invagination of its apical margin on the dorsal side.

Hydriomena regulata Pearsall

Text figure 180

Hydriomena regulata PEARSALL, 1909, Proc. Ent. Soc. Washington, vol. 11, p. 131. SWETT, 1915, Canadian Ent., vol. 47, p. 59, BARNES AND MCDUNNOUGH, 1917, Contributions to the natu-

ral history of the Lepidoptera of North America, vol. 4, no. 1, p. 35, pl. 6, fig. 15 (paratype).

Apart from the two female types (not males as originally stated), which are now in the American Museum of Natural History, *ex* Pearsall collection, no other material of this species has come to light. These two specimens have been carefully examined and slides made of their genitalia which are similar except in minor details. The complicated organ has great similarity to that of *furculoides*, and both are quite unique and distinctive from that of other species.

As may be seen from the figure given in the 1917 revision, which is that of a paratype as herewith designated, the maculation of the primaries is very obscure, the whole wing being suffused with purplish brown; a somewhat paler patch below the costa in the postmedian area is less noticeable in the holotype than in the paratype, as figured. Both specimens are not in the best of condition. From *furculoides* they differ, apart from genital characters, in the smaller size and much heavier purplish suffusion of the primaries; line I is also more oblique and lacks the sharp angle below costa found in *furculoides*. The time of flight appears to occur much later in the season, as the types bear the date August 22, 1908, and *furculoides*, judging by a series in the Sperry collection from Alpine, Arizona, flies in the first half of June. The locality data given on the type specimens are rather puzzling, as the labels read "Douglas, Chiricahua Mountains, Arizona." According to the map Douglas is situated in the extreme south of Cochise County quite close to the Mexican border and the nearest mountain range appears to be the Perilla Mountains. The Chiricahua Mountains are much farther to the north and east. The earlier collectors were often very inaccurate in their locality data.

MALE GENITALIA: Unknown.

FEMALE GENITALIA: (Based on the holotype). A very complicated chitinous structure which seems to be a combination of genital plate and ductus bursae. The whole forms a more or less rectangular plate, considerably higher than wide, the upper section of which appears to be surrounded by an amorphous mass. The proximal portion is more or less separated from the remainder

of the plate, has a slightly crenulate outer margin and a number of vertical striae, and shows on each side a small hollow. The remainder of the plate, a much larger section, is weakly chitinized and poorly defined proximally, with a large hollow on the left side and the commencement of the ductus seminalis on the right side. Its main characteristics are found in three distal, chitinized projections into the upper part of the bursa; the one on the left side terminates in a very strong spine, directed inward; a longer one on the right side forms a broad rod that terminates bluntly; approximate to this on the inner side is a third shorter blunt projection. The small globular bursa is entirely membranous and is attached to the distal end of the chitinous plate.

TYPES: Holotype, female, and paratype female, Douglas, Chiricahua Mountains, Arizona, August 22, 1908, in the American Museum of Natural History, *ex* collection Pearsall.

DISTRIBUTION: Known only from the two types from the above locality.

REMARKS: Judging by the slide of the genitalia of the paratype, slight differences occur in the contour of the chitinous plate and its projections, possibly because of a certain amount of shriveling of the parts during drying of the specimen.

Hydriomena furculoides Barnes and McDunnough

Text figures 114, 115, 181

Hydriomena furculoides BARNES AND McDUNNOUGH, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 33, fig. 10, pl. 5, fig. 15 (holotype).

The only species with which *furculoides* is liable to be confused is *morosata* which also occurs in Arizona. The males are, of course, readily distinguished by the deeply furcate nature of the uncus which can easily be observed by removing a few scales from the end of the abdomen. In the maculation the courses of lines I and III differ as can be seen by a comparison of the figures of both given in the 1917 revision; line I is angled at right angles below the costa, much more sharply than in *morosata*, and further shows a stronger incurve across the fold than is nor-

mally found in the latter species; line III is virtually upright, with faint crenulations for the greater part of its course, while this line in *morosata* is decidedly more sinuate. The postmedian pale area is much narrower in *furculoides* than in *morosata* and generally shows a dark transverse streak in the cell not found in the other species. The palpi are long and blade-like, and the male antennae, while rather thin and laterally compressed, are stouter than in *morosata*. The species appears to be not uncommon in mid June in the White Mountains of Arizona, and there is a long series in several collections taken by G. and J. Sperry at Alpine, Apache County.

MALE GENITALIA: (Based on a specimen from Alpine, Arizona). Uncus with long narrow neck, the apical half bifurcate, the forks being long, gradually diverging and narrowing distally, with their apices slightly bent inward and pointed; the space between the forks U-shaped. Tegumen broadened rapidly immediately below uncus, following which the sides are only slightly outwardly oblique and are widely separated by a long, inverted, V-shaped, open space; the usual inward projections are weak and pointed. Transtilla projections weak, pointed, and with scattered setae over their entire surface. Clasper rather narrow at base, with a sacculus more strongly chitinized than usual and extending along the ventral side for more than half of the length of the clasper, terminating in a blunt point; valvula broadened out considerably; costal edge strengthened by a band of chitin which projects slightly beyond the apex of the valvula as a sharp point; only a single, weak, costobasal tubercle which arises on the dorsal side of a chitinous bar which overlaps the costa; the usual chitinous ribbon arising from the tubercle is much twisted, with pointed apex. Juxta plate quite unique; the base is broad, convexly rounded, and giving rise to two small lateral tubercles clothed with rather long hairs and situated distad of the basal edge, the space between them rather

wide and trough-like; the remainder of the plate is weakly chitinized, broadly rectangular, with straight distal edge. Anellus very heavily spined, the spines small at base, increasing greatly in size distally where they are broad at their bases and sharply pointed. Aedeagus (fig. 115) more or less cone shaped; basal half narrow, with rounded apex; considerably broadened in apical section, terminating on the ventral side in a rounded, weakly spined projection; on the dorsal side there is a deep invagination of the edges, the pocket thus formed containing a number of strong spines of varying length.

FEMALE GENITALIA: (Based largely on the allotype). Very similar in general appearance to the organ of *regulata*. Composed of a large chitinized rectangular body which terminates as in *regulata* with a left side bar ending in a large spine and a right side bar, less prominent than in *regulata*, and more narrowed terminally; the third bar which is quite close to this latter bar in *regulata* is situated medially in the present species and terminates with rounded apex. In the proximal section of the plate the structure is more complicated than that of *regulata*; there is a central projecting piece of chitin, broadly rounded apically, with slightly dentate edge; to the left of this is a hollowed section with raised edges which might possibly be the entrance of the ostium; the whole is overlapped by a rounded chitinous strip extending across the entire plate. The central portion of the plate contains a number of vertical streaks. This complicated structure is very difficult to describe and still more to delineate, but it is hoped that the salient features have been indicated.

TYPES: Holotype, male, Redington, Arizona; allotype, female, Tucson, Arizona, in United States National Museum, *ex* collection Barnes.

DISTRIBUTION: Southeastern Arizona, especially in the area of the White Mountains (Alpine, Greer Road, Turkey Creek Road).

GROUP VIII

It seems best to place the species *similaris* in a group by itself, as it shows characters in

both male and female genitalia that differ considerably from those of any of the other

species. Its closest relationship is evidently with the preceding group, as is shown by the genitalia of the male and to a lesser extent by those of the female. In the single costobasal tubercle of the male clasper the species agrees with *furculoides*, but its uncus is totally different, being short and chunky, with a somewhat hooded apex. The heavy spining of the anellus is quite similar in both species, and there are also points of resemblance in the aedeagus, but the armature in the present instance is carried to a further degree of specialization. In the female genitalia, while a genital plate is present, it is smaller and very much more weakly chitinized and shows none of the complicated distal armature found in the females of the preceding group; it also possesses a thin membranous ductus bursae which is entirely lacking in both *furculoides* and *regulata*. The type of maculation and coloration of the primaries is similar to that of these species, and the long porrect palpi form another point of resemblance.

***Hydriomena similaris similis* Hulst**

Text figures 116, 117, 182

Hydriomena similis HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 284. BARNES AND McDUNNOUGH, 1916, Contributions to the natural history of the Lepidoptera of North America, vol. 3, no. 3, p. 176; 1917, *op. cit.*, vol. 4, no. 1, p. 35, pl. 6, figs. 1, 2, pl. 10, fig. 4 (genitalia).

Hydriomena glenwoodata SWETT, 1909, Canadian Ent., vol. 41, p. 231; 1912, *ibid.*, vol. 44, p. 229. BARNES AND McDUNNOUGH, 1912, Contributions to the natural history of the Lepidoptera of North America, vol. 1, no. 4, p. 31, pl. 14, fig. 24 (holotype); 1916, *op. cit.*, vol. 3, no. 3, p. 176 (synonymy).

This small grayish species is not uncommon in Colorado, New Mexico, and Arizona. New Mexico specimens are generally larger and darker in maculation than Colorado ones and the two figures in the 1917 revision show this distinctly and can be used to trace the courses of the various cross lines quite satisfactorily; the somewhat S-shaped course of line III is perhaps the most characteristic feature. The palpi are distinctly long, thin, and porrect. Judging by the genitalia of both sexes the species belongs in a group by itself, although it is quite possible that its affinities are with other species in Mexico and Central America.

MALE GENITALIA: Uncus short and stubby; basal portion considerably thickened; ventral surface largely hollowed out, the sides rising from a V-shaped base, curving outward and meeting apically to form a slight hood with blunt apex. Tegumen narrow at its junction with the uncus, then rounded outward to a broad base, with strong, blunt, chitinous, inward projections in median section; viewed dorsally it is virtually entire, with the subdivisions of group I only faintly indicated by a median line. Transtilla processes short and chunky, with a vestiture of scattered setae. Clasper rather narrow, with a considerable medial invagination of the ventral margin; costa broadly chitinized, extending well beyond the junction with the valvula and terminating in a bent hook; only a single large costobasal tubercle present projecting caudad over the costa and giving rise to a broad twisted chitinous ribbon with bluntly pointed apex. On the dorsal side of this tubercle a strong tuft of weakly knobbed, curved hairs arises. Juxta plate broad, very indistinctly outlined, with rounded base attached to the sides of the sacculus, broadening apically and terminating in two lateral truncate projections; inward from these are clusters of long hairs, and there are other shorter scattered setae on the basal half of the plate. Anellus very strongly armed with a large number of spines, very bluntly pointed in basal section and quite sharp apically. Aedeagus very characteristic; its basal half is narrow, curved ventrad, and bluntly rounded; the distal half is much broader, with a large apical opening; the ventral edge is armed with two chitinous rods which project somewhat, one being broad and rounded apically, the other more in the form of a spine and partially concealed by the larger piece. On the dorsal side there is an invagination of the membrane, the pocket thus formed containing a double row of spines which project over its edges to a slight degree.

FEMALE GENITALIA: Difficult to describe, as the organ is partly surrounded by a gelatinous mass which hinders observation. The central portion of the sternite of segment VIII is slightly depressed to form a species of trough, feebly spiculate and furrowed, leading to a large chitinized genital plate situated

on its cephalic margin; this plate is variably hourglass shaped, its caudal edge being finely spiculate; it narrows considerably medially, and its outline then becomes obscured, but at its junction with the ductus bursae a twisted, finely spiculate flap is present. The ductus bursae is very weak and membranous, its proximal section somewhat broader and appearing to form irregular folds, the ductus seminalis arising from a small sac on its right side. Beyond this it narrows to a thin short tube which enters the small, globular, membranous bursa at its proximal end without any apparent delimitation of the two sections.

Types: Holotype, male, and allotype, female, Colorado (Graef). These were formerly in the Brooklyn Institute of Arts and Sciences and should now be in the United States National Museum which acquired this collection. *Glenwoodata*, holotype male and allotype female, Glenwood Springs, Colorado, August 1-7, in United States National Museum, *ex* collection Barnes. Paratype, female, Halfway House, Pikes Peak, Colorado, in Museum of Comparative Zoölogy, *ex* collection Swett.

Distribution: Colorado (Platte Canyon, July 21; Glenwood Springs, August 1-7; Durango, July 5, 6); New Mexico (Jemez Springs, Frijoles Canyon, June 21); Arizona (Pinal Mountains; Todd's Lodge, Oak Creek Canyon, June 18; Tucson).

Remarks: A single female in the Los Angeles County Museum, which on genitalic characters certainly belongs to *similaris*, bears the label "Santa Cruz, California,

April 6, 1918." The occurrence of the species in such a locality certainly needs verification.

Hydriomena similaris terminipunctata

Barnes and McDunnough

Hydriomena terminipunctata BARNES AND MCDUNNOUGH, 1916, Contributions to the natural history of the Lepidoptera of North America, vol. 3, no. 1, p. 22, pl. 2, fig. 7 (paratype).

Hydriomena similaris var. *terminipunctata*, BARNES AND MCDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 35.

The race is characterized by the paler coloration of the primaries, the ground color being a light gray. As the name implies, there is a series of small pale marks along the outer margin of the secondaries, a character that can at times be discerned very faintly in the nimotypical race. The specimen figured with the original description is a very well-marked female. Many specimens show a more suffused maculation. There is nothing in the genitalia which differs from those of Colorado and Arizona specimens.

Types: Holotype, male, allotype, female, and two female paratypes, Stockton, Utah (July), in the United States National Museum, *ex* collection Barnes.

Distribution: Utah (Stockton; Provo, July 4; north fork, Provo Canyon, July 31, August 4).

Remarks: All the material examined had been taken by Tom Spalding, who for years collected in the region of Provo and Stockton, selling his material to various institutions. Since his death, scarcely any intensive collecting has been done in this region.

GROUP IX

Two species, *nubilofasciata* Packard and *manzanita* Taylor, are included in this group, largely because both possess a signum in the female bursa, a character that is not found in any other member of the genus. Both species also show a dark marginal border in the maculation of the primaries, which is another distinctive feature. Otherwise the two have little in common and are in all probability not very closely related. Eventually each may require a subgeneric or even a generic term, as many authors, notably Heinrich in the

Eucosmidae, consider the presence of a signum in the bursa as of generic value. The food plants of the larvae of the two species are quite distinct; *nubilofasciata* is said to feed on oak, while Taylor records the larva of *manzanita* on arbutus.

***Hydriomena nubilofasciata* Packard**

Text figures 118, 119, 183

Hypsipetes nubilofasciata PACKARD, 1871, Proc. Boston Soc. Nat. Hist., vol. 13, p. 398.

Hydriomena sordidata var. *nubilofasciata*, PACK-

ARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 98, pl. 8, figs. 31, 35.

Hydriomena sparsimacula HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 285.

Hydriomena banavahrata STRECKER, 1899, Lepidoptera, Rhopaloceres and Heteroceres, suppl. 2, p. 11. SWETT, 1912, Canadian Ent., vol. 44, p. 229 (as *lanavahrata*, typ. err.); 1918, *ibid.*, vol. 50, p. 294. BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 12.

Hydriomena scalata WARREN, 1904, Novitates Zool., vol. 11, p. 519. SWETT, 1911, Canadian Ent., vol. 43, p. 79.

Hydriomena nubilofasciata var. *raptata* SWETT, 1910, Canadian Ent., vol. 42, p. 281; 1911, *ibid.*, vol. 43, p. 79.

Hydriomena nubilofasciata var. *cumulata* SWETT 1910, Canadian Ent., vol. 42, p. 281; 1911, *ibid.*, vol. 43, p. 80; 1915, *ibid.*, vol. 47, p. 63 (correction). BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 42, pl. 2, fig. 6.

Hydriomena nubilofasciata var. *cupidata* SWETT, 1910, Canadian Ent., vol. 42, p. 282; 1911, *ibid.*, vol. 43, p. 79.

Hydriomena nubilofasciata var. *vulnerata* SWETT, 1910, Canadian Ent., vol. 42, p. 282; 1911, *ibid.*, vol. 43, p. 80. BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 42, pl. 2, figs. 7, 8. BLACKMORE, 1921, Ann. Rept. British Columbia Prov. Mus., p. 21, pl. 4. HARDY, "1950" [1951], Proc. Ent. Soc. British Columbia, vol. 47, p. 25.

Hydriomena nubilofasciata, SWETT, 1911, Canadian Ent., vol. 43, p. 79; 1918, *ibid.*, vol. 50, p. 294 (type restriction). BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 12, pl. 2, figs. 4, 5, pl. 7, fig. 6 (genitalia).

Hydriomena nubilofasciata var. *sparsimacula* SWETT, 1911, Canadian Ent., vol. 43, p. 80.

This early spring species occurs in almost innumerable forms in both male and female sexes along the entire Pacific coast from British Columbia to southern California; it is one of the most common species of that region. The form *sparsimacula* as the name indicates was based on specimens simply labeled "Calif.," with much reduced maculation, a character found frequently in females. *Scalata*, which was described from two Oregon males, proves, on examination of a paratype and a specimen said by Mr. D. Fletcher of the British Museum to match the holotype

excellently, to be nothing but a synonym of the typical form. *Banavahrata* can also be definitely placed as a minor female form. Swett has proposed several more "varietal" names, the word being used in the present sense of "form." In his summary of these various forms (1911, Canadian Ent., vol. 43, p. 82) he separates them as follows:

" <i>Hyd. nubilofasciata</i> Pack.	Yellow, reddish cast.
Var. (A) <i>raptata</i> Swett	(a) green, suffused.
" (B) <i>scalata</i> Warren	(b) red and green, green shaded.
" (C) <i>cupidata</i> Swett	(c) red.
" (D) <i>cumulata</i> Swett	(d) suffused, smoky.
" (E) <i>vulnerata</i> Swett	(e) white banded.
" (F) <i>sparsimacula</i> Hulst	(f) marks on costa only."

This summary should enable those interested in form names to place their specimens more or less correctly, but it should be noted that there are numerous intergrades between these named forms as well as many others which have fortunately escaped without a name; it is to be hoped that they may continue to do so.

The one characteristic in the maculation of the primaries of all these forms is the presence of a narrow, terminal, dark margin, a feature found only in *manzanita* which is otherwise totally dissimilar. The palpi are very short and the male antennae rather stout and latterly compressed.

Judging by the few specimens seen in the long series contained in various collections, the species appears to be fairly rare in British Columbia and restricted to southern Vancouver Island. No specimens from Washington State have been noted, but good series have been examined from Corvallis and McMinnville, Oregon, which show considerable variation and prove that the name *scalata* cannot be used in a racial sense. A very large number of specimens were collected by H. F. Sternitzky at Laytonville, Mendocino County, California, in early March; these specimens are now in the Sperry collection and the author's collection. William Bauer finds the species plentiful in the various counties of the San Francisco Bay area from late January until well into March. From the various coastal counties south of this area odd specimens have been noted, and in River-

side and Los Angeles counties it appears to be widespread, extending into such desert regions as Palm Springs. The Los Angeles County Museum also contains a fair series taken at Camp Cascades, Yosemite Valley, in March which shows that the species is not entirely coastal in its distributional range. No Arizona specimens have been seen, although both Swett and Barnes and McDunnough report it from this state, the locality given by the latter authors being "Palmerlee, Ariz. (April)." It has been found impossible, owing to the multiplicity of forms in any one region, to subdivide the species into well-defined subspecies.

MALE GENITALIA: (Based on a specimen from Napa County, California). Uncus strap-like, narrowing medially from a moderately broad basal section and again expanding somewhat apically, the extreme apex bent ventrad, with the terminal margin narrowly excavated. Tegumen rather short, narrow and somewhat rounded apically, the sides sloping outward, with short, blunt, inward projections near base; dorsal subdivisions much as in group I; cephalic margin with a very deep, U-shaped, median invagination. Transtilla processes weak, short, and rather chunky, with a few short apical setae. Clasper narrow, sacculus better chitinized than usual, extending far along ventral margin where it bends outward at the base of the quite small valvula; costa with the usual strongly chitinized margin, projecting well beyond the edge of the valvula and ending as a long thin spine; costobasal tubercles I and II present, tubercle I being large and tubercle II very long and narrow; a single, sickle-shaped, chitinous ribbon arises from each, moderately wide, slightly broadening before a fine hooked apex. Juxta plate quite characteristic, terminating apically in two long lateral spines, slightly setose; from these apices the sides slope almost rigidly inward to a narrow rounded base from which arises a tuft of fairly long setae; marginal, thinly chitinized bands broad and extending the whole length of the plate; scattered setae along the lateral regions of the plate; the rounded extension of the base is weak and faintly spiculate. Vinculum narrowly rounded apically. Anellus finely spiculate. Aedeagus moderately wide, narrowed in the proximal section, armed api-

cally with a double row of short stout teeth; vesica with a faint twisted band of weak cornuti.

FEMALE GENITALIA: Ostium broad, bluntly and shortly funnel shaped, very weakly chitinized, its distal end slightly overlapping a complete, much narrower, chitinous ring, which appears to represent the initial portion of the ductus bursae. It is continued by an entirely membranous tube, slightly bulged proximally on the right side; this tube, which might be likened to the neck of the bursa, gradually expands into the bursa proper which is entirely membranous, irregularly oval, with a prominent proximal bulge on the right side on which is situated the very characteristic spined signum; the left side is somewhat incurved in the median section. The ductus seminalis arises on the right dorsal side, immediately below the chitinous ring.

TYPES: Holotype, male, California, in Museum of Comparative Zoology. *Scalata*, holotype, male, Gold Hills, Oregon, in British Museum (Natural History). Form *sparsimacula*, holotype, sex unknown, California, in Rutgers University, New Brunswick, New Jersey; paratype presumably in the United States National Museum, *ex* collection Brooklyn Institute of Arts and Sciences. Form *banavahrata*, holotype, probably female, in Chicago Natural History Museum, *ex* collection Strecker. Forms *raptata*, *cupidata*, *vulnerata*, holotypes, males; and form *cumulata*, holotype, female; all in Museum of Comparative Zoology.

DISTRIBUTION: Pacific coastal region from Vancouver Island, British Columbia, to San Diego County, California, extending inland to the Yosemite Valley and farther south into the interior of Riverside and Los Angeles counties. Said to occur in southeastern Arizona.

LARVAL FOOD PLANT: Oak (*Quercus garryana*).

***Hydriomena manzanita* Taylor**

Text figures 120, 121, 184

Hydriomena manzanita TAYLOR, 1906, Canadian Ent., vol. 38, p. 400. GROSSBECK, 1908, Proc. Ent. Soc. Washington, vol. 10, p. 85. SWETT, 1911, Canadian Ent., vol. 43, p. 80. BARNES AND MCDUNNOUGH, 1912, Canadian Ent., vol. 44, p. 274;

1917, Contributions to the natural history of the Lepidoptera of North America, vol. 4, no. 1, p. 12, pl. 2, figs. 10, 11, pl. 8, fig. 1.

This easily recognized species of the Pacific coast needs little further description; by a reference to the figures given in the 1917 revision the two main forms as regards the maculation of the long, narrow, gray primaries may be noted. When well marked, lines I and III and band II all show a strong outward angle below costa which is practically a right angle; the postmedian paler space is narrow and frequently almost entirely obliterated by deep gray suffusion; line IV is evenly rounded below costa and then slightly convex to inner margin; band V is broad in the costal region, resembling in this respect band II; the outer margin is bordered by a narrow dark band much as in *nubilofasciata*.

The palpi are moderate in length and rather stubby, being considerably longer than those of *nubilofasciata*; the male antennae are quite stout, and the ventral margin is decidedly serrate.

Based on material from Vancouver Island, British Columbia, the species occurs at least as far south in California as the San Francisco Bay area, and good series have been examined from Laytonville, Mendocino County, and Spring Mountain, Napa County. The flight of the species is from March to May according to latitude.

MALE GENITALIA: (Based on a topotypical specimen). Uncus with short, moderately broad base with slight lateral bulges and a few thin, fairly long setae; the base is followed by a long thin neck which broadens apically to become spoon shaped, the extreme apex being rounded and sparsely covered ventrally with thin setae. Tegumen short and narrow, rounded apically, the sides gently outwardly oblique to near base where they become strongly outcurved; the dorsal subsections are much as in group I, but elongate and narrow; the cephalic edge shows a very strong, median, rounded excavation. Transtilla processes weak but very long and upright, with scattered setae over their surface. Clasper narrow; sacculus long and better chitinized than usual; valvula little expanded; costal edge rather weakly chitinized and scarcely projected beyond the margin of the anellus as a blunt point; costobasal tubercles

I and II present but much reduced in size and directed dorsad from a chitinous plate that overlaps the costa; both give rise to single, thin, sickle-shaped ribbons; weak tufts of simple hairs arise apicad of tubercle II. Juxta plate high and narrow, the sides poorly delineated except apically, directed obliquely outward from a narrow, stalk-like base to apex which shows well-developed, lateral, conical projections with blunt apices, somewhat reminiscent of those of *nubilofasciata* but not nearly so long; they are sparsely covered with short setae; a wide, thinly chitinized, marginal band extends along each side to the base of the apical projections; scattered, fairly long setae occur on the plate. Anellus weakly spiculate. Vinculum broadly rounded apically. Aedeagus rather short and broad, armed with a ventral cluster of long spines which extend almost the entire length of the organ and are superimposed on a similarly long dorsal series of much shorter spines which form an irregular mass.

FEMALE GENITALIA: (Based on a topotypical specimen). Posterior abdominal segments greatly extended. Apophyses very long and slender, Ostium with a broad opening, the proximal portion very weakly chitinized and little narrowed apically; beyond this chitinous section it contracts sharply to a short membranous tube which terminates in a long chitinous half ring. The very large, irregularly sac-like bursa is attached to this ring, and is entirely membranous; narrow at first, it expands rapidly, showing a median invagination on the right and two smaller ones on the left side towards the distal end; above the first of these on the ventral side a large signum is placed, being more or less irregularly circular and entirely covered with minute excrescences, giving it a shagreened appearance; the center is slightly raised and is furnished with a strong blunt spine, directed inward. On the dorsal side proximally is a second small signum without central spine. The ductus seminalis is minute and arises dorsally from the extreme left proximal end of the bursa.

TYPE: Holotype, male, Wellington, Vancouver Island, British Columbia, April 21, 1903, in United States National Museum, *ex* collection Barnes.

DISTRIBUTION: Pacific coast region from

Vancouver Island, British Columbia, to central California (Mendocino County, Napa County, Santa Cruz County).

HYMENODRIA, NEW GENUS

On account of the great dissimilarity of the genital organs of *mediodentata* from those of members of the preceding groups, it becomes necessary to erect a new genus for this species which is characterized as follows.

Palpi rather long, more or less porrect, projecting rather more beyond the front than its width between the eyes. Male antennae laterally compressed as in *Hydriomena*, rather thin, ventral edge slightly serrate. Metathorax with distinct tuft on scutellum. Primaries narrow, pointed, with a small tuft of hairs situated about the middle of inner margin. Venation much as in *Hydriomena*. Male genitalia with uncus formed by two broad curving arms with spined projections on ventral side. Clasper without costobasal tubercles. Transtilla processes short and chunky. Juxta plate broad and somewhat shield shaped. Sides of vinculum joined apically. Aedeagus short and chunky, unarmed. Female genitalia with broad, chitinized ductus bursae, strongly bulging cephalad on right side, bent to right apically and terminating in a short membranous bursa without digitabulum.

GENEROTYPE: *Hydriomena mediodentata* Barnes and McDunnough.

REMARKS: Lest some enterprising lepidopterist endeavors to discover a classical derivation of the generic name, it seems advisable to state that the name is simply an anagram of *Hydriomena*.

Hymenodria mediodentata Barnes and McDunnough, new status

Text figures 122, 185

Hydriomena mediodentata BARNES AND MCDUNNOUGH, 1911, Jour. New York Ent. Soc., vol. 19, p. 160; 1912, Contributions to the natural history of the Lepidoptera of North America, vol. 1, no. 4, p. 45, pl. 21, fig. 12 (holotype); 1916, *op. cit.*, vol. 3, no. 1, p. 22; 1917, *op. cit.*, vol. 4, no. 1, p. 36, fig. 11, pl. 6, fig. 3.

Very few specimens of this species are known. Besides the holotype female from Palmerlee, Arizona, *ex* Barnes collection, the United States National Museum contains the

male from the same collection figured in 1917 and another male from Paradise, Cochise County, April 1-7. In the Canadian National Collection is a single male from Globe, Arizona, May 1-15, and a female in the Sperry collection has been examined from the Baboquivari Mountains, Arizona, April 26, 1938.

The two females examined show the primaries evenly suffused with deep smoky brown. In the males there is considerable variation in the amount of orange suffusion in the median areas; the Globe male is unicolorous smoky as in the females; the male figured in 1917 (pl. 6, fig. 3) is considerably tinged with orange; and the Paradise male shows less of this coloration.

MALE GENITALIA: (Based on a specimen from Palmerlee, Arizona). Uncus composed of two broad forks, widely separated at the base, then convex and incurving apically; on inner sides near base are rounded protuberances bearing strong clusters of stout spines; the ventral surfaces apically are clothed with long setae. Tegumen very broad and short, with convex sides and strong inward projections near base. Transtilla processes short and quite chunky, with a vestiture of scattered setae. Clasper more or less of the usual *Hydriomena* type; invagination of ventral margin very slight; no costobasal tubercles nor chitinous ribbons; tufts of simple hairs from a slight elevation near base; chitinized costal margin short and narrowed apically to a point, not projecting beyond valvula. Juxta plate broad and shield shaped; base broad, with a large rounded invagination; the sides are rather narrowly chitinized and are produced apically into hammer-like processes; central portion of plate thin, with no apparent setal vestiture. Vinculum sides joined, forming a slight point. Anellus very finely spiculate. Aedeagus short and rather chunky; no armature of the vesica.

FEMALE GENITALIA: Ostium membranous, funnel shaped, terminating in a weakly chitinized half collar. Ductus bursae with its extreme proximal end membranous, the ductus seminalis arising here as a small bulb and directed to the right. Balance of ductus chitinous, the left margin strongly convex and bending to the right distally; the greater portion of the right side is composed of a

large bulging section, leaving the distal portion of the ductus as a short broad tube, through which medially a weak septum passes. The oval membranous bursa is attached to the terminal end of the ductus and is without trace of digitabulum.

TYPE: Holotype, female, Palmerlee, Arizona, in United States National Museum, ex collection Barnes.

DISTRIBUTION: Southeastern Arizona [Cochise County (Palmerlee, Paradise); Pima County (Baboquivari Mountains)].

LIST OF SPECIES

Hydriomena Hübner

Group I

1. tuolumne Barnes and McDunnough
2. exculpata Barnes and McDunnough
 form tribulata Barnes and McDunnough
 - a. josepha McDunnough
 - b. nanata McDunnough
3. expurgata Barnes and McDunnough
 - a. franclemonti McDunnough
 henshawi Barnes and McDunnough
 (*nec* Swett)
 - b. nicolensis McDunnough
 - c. alticola McDunnough
4. shasta Barnes and McDunnough
5. borussata Barnes and McDunnough
 brunneata Barnes and McDunnough
6. henshawi Swett
7. irata Swett
 form niveifascia Swett
 - a. lolata McDunnough
 - b. quaesitata Barnes and McDunnough
8. perfracta Swett
 pluviata Guenée (*partim*)
 - a. marmorata Barnes and McDunnough
 - b. centralis McDunnough
 - c. monoensis McDunnough
9. charlestonia McDunnough
10. marinata Barnes and McDunnough
 - a. exasperata Barnes and McDunnough
11. edenata Swett
 - a. prasinata McDunnough
 - b. baueri McDunnough
 - c. grandis Barnes and McDunnough
 - d. olivata Wright
 - e. pallidata Wright
 - f. indistincta McDunnough
12. furtivata McDunnough
13. johnsoni McDunnough
14. divisaria Walker
 autumnalis Hulst (*nec* Strömeyer)
 pluviata Barnes and McDunnough (*nec* Guenée)
 - a. brunnescens McDunnough
 - b. frigidata Walker
15. renunciata Walker
 pluviata Guenée (*partim*)
 trifasciata Packard (*nec* Borkhausen)
 autumnalis Hulst (*nec* Strömeyer)
 nigrescens Swett (*nec* Hoyningen-Heune)
 pernigrata Barnes and McDunnough
 (*partim*)
 - a. columbiata Taylor
 - b. pernigrata Barnes and McDunnough
 - c. viridescens McDunnough
16. transfigurata Swett
 - a. manitoba Barnes and McDunnough
 frigidata Barnes and McDunnough
 (*nec* Walker)
17. bistriolata Zeller
 pluviata McDunnough (*nec* Guenée)
18. pluviata Guenée
 transfigurata Swett (*partim*)
 - a. meridianata McDunnough
19. obliquilinea Barnes and McDunnough
20. rita McDunnough
21. arizonata Barnes and McDunnough
 chiricahuata Swett (*partim*)
22. albimontanata McDunnough
23. sierrae Barnes and McDunnough
24. nevadae Barnes and McDunnough
 similaris Hulst (*nec* Hulst)
25. californiata Packard
26. crokeri Swett
 - a. comstocki McDunnough
 glaucata Barnes and McDunnough
 (*nec* Packard)
 form waltoni McDunnough
27. glaucata Packard
28. muscata Barnes and McDunnough
29. chiricahuata Swett
30. modestata Barnes and McDunnough
31. mississippiensis McDunnough
32. feminata McDunnough
33. ruberata Freyer
 form variegata Prout
 - a. pallula McDunnough
34. macdunnoughi Swett
35. septemberata McDunnough

Group II

36. *furcata* Borgström
 sordidata Fabricius
 quinquefasciata Dod (*nec* Packard)
 a. *fergusoni* McDunnough
 37. *quinquefasciata* Packard
 form viridata Packard
 form periclata Swett
 38. *catalinata* McDunnough
 39. *costipunctata* Barnes and McDunnough

Group III

40. *albifasciata* Packard
 form resecta Swett
 form puncticaudata Barnes and McDunnough
 beldenae Guedet
 a. *victoria* Barnes and McDunnough
 b. *reflata* Grote
 abacta Hulst
 41. *cochiseata* Swett
 form swetti Barnes and McDunnough

Group IV

42. *speciosata* Packard
 form agassizi Swett
 form taylori Swett
 form ameliata Swett
 43. *morosata* Barnes and McDunnough
 form gravis McDunnough
 44. *barnesata* Swett

45. *cyriadoides* McDunnough46. *sperryi* McDunnough

Group V

47. *bryanti* McDunnough
 48. *clarki* Wright

Group VI

49. *magnificata* Taylor
 50. *gracillima* McDunnough

Group VII

51. *regulata* Pearsall
 52. *furculoides* Barnes and McDunnough

Group VIII

53. *similaris* Hulst
 glenwoodata Swett
 a. *terminipunctata* Barnes and McDunnough

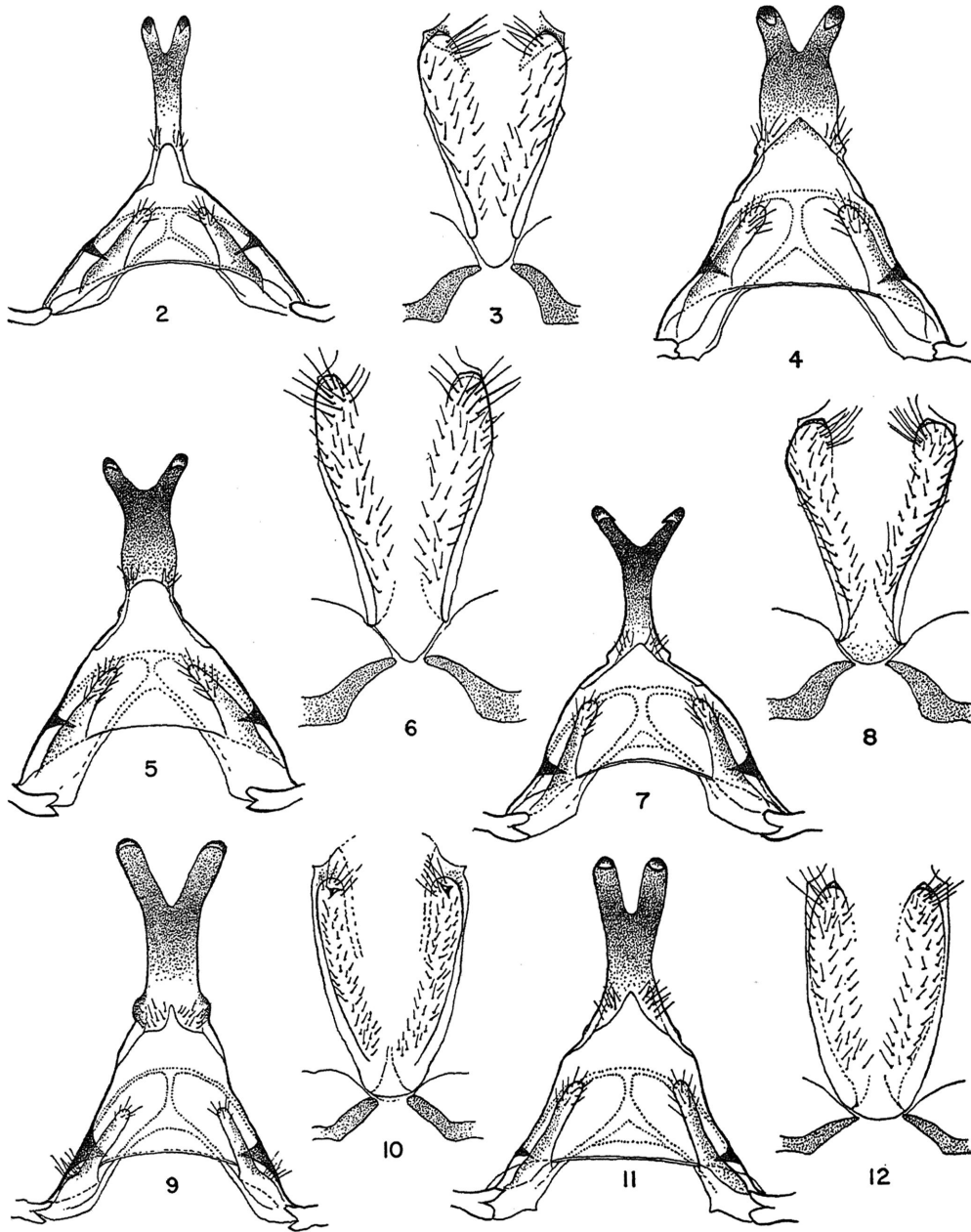
Group IX

54. *nubilofasciata* Packard
 scalata Warren
 form sparsimacula Hulst
 banavahrata Strecker
 form raptata Swett
 form cumulata Swett
 form cupidata Swett
 form vulnerata Swett

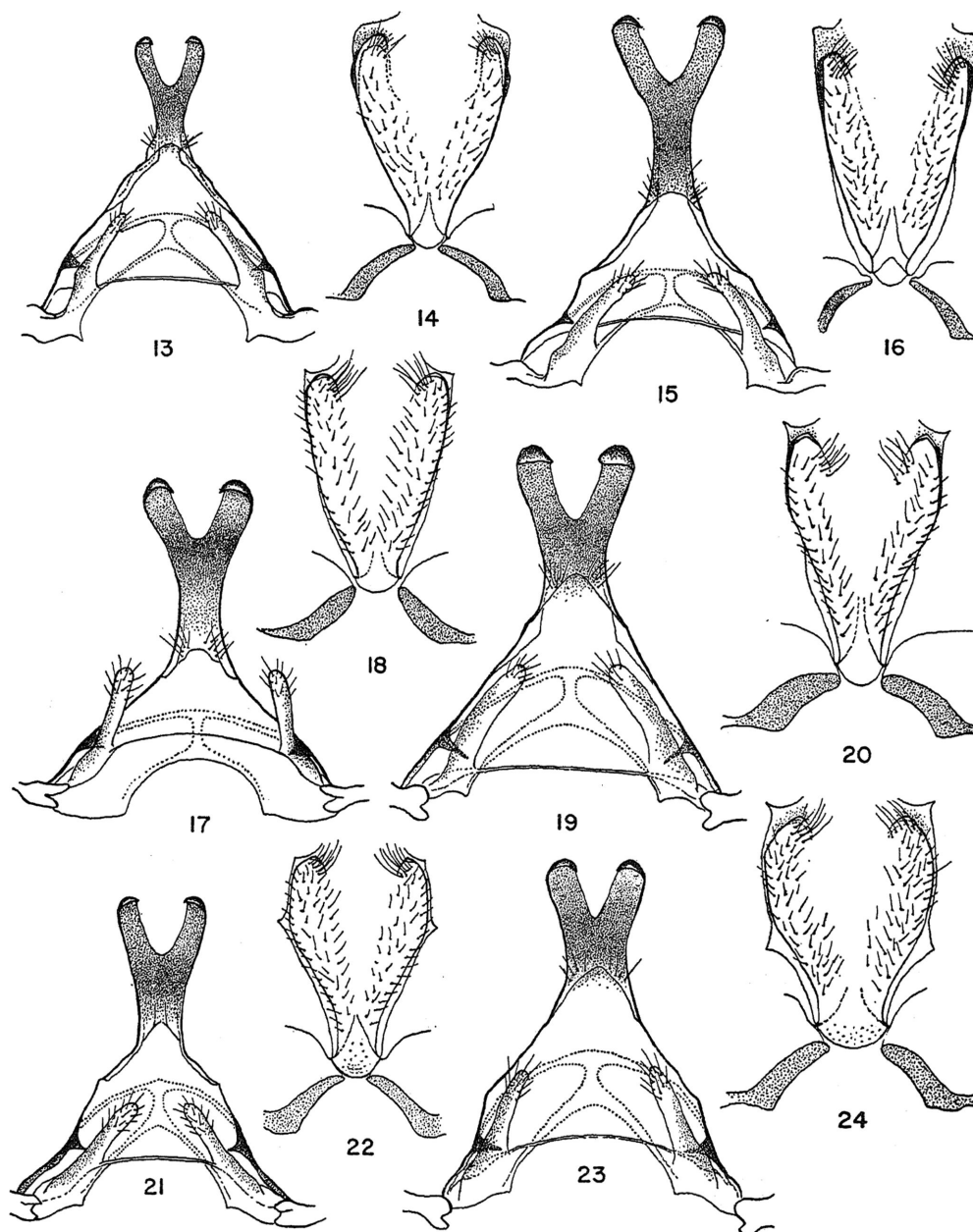
55. *manzanita* Taylor

Hymenodria McDunnough

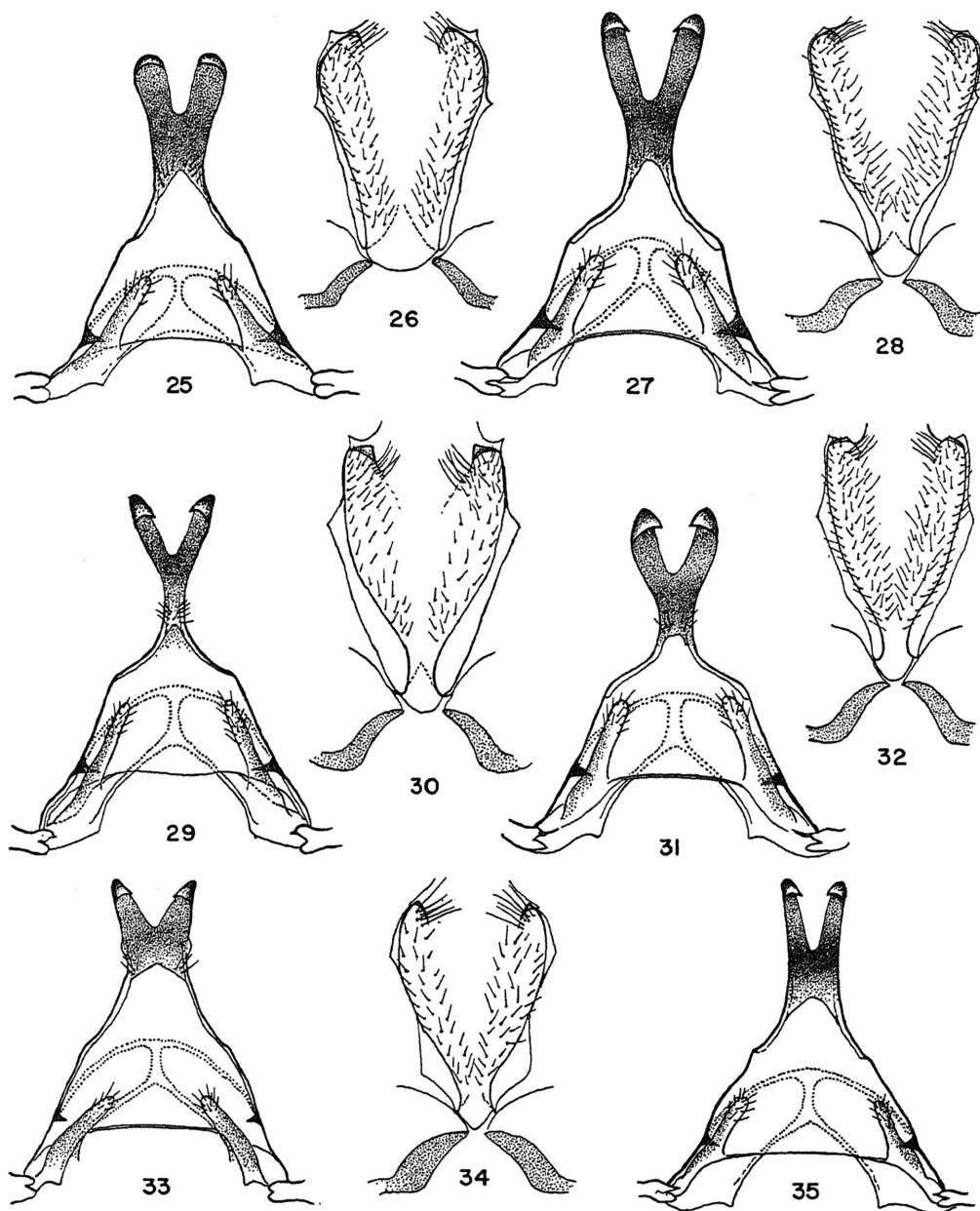
1. *mediodentata* Barnes and McDunnough



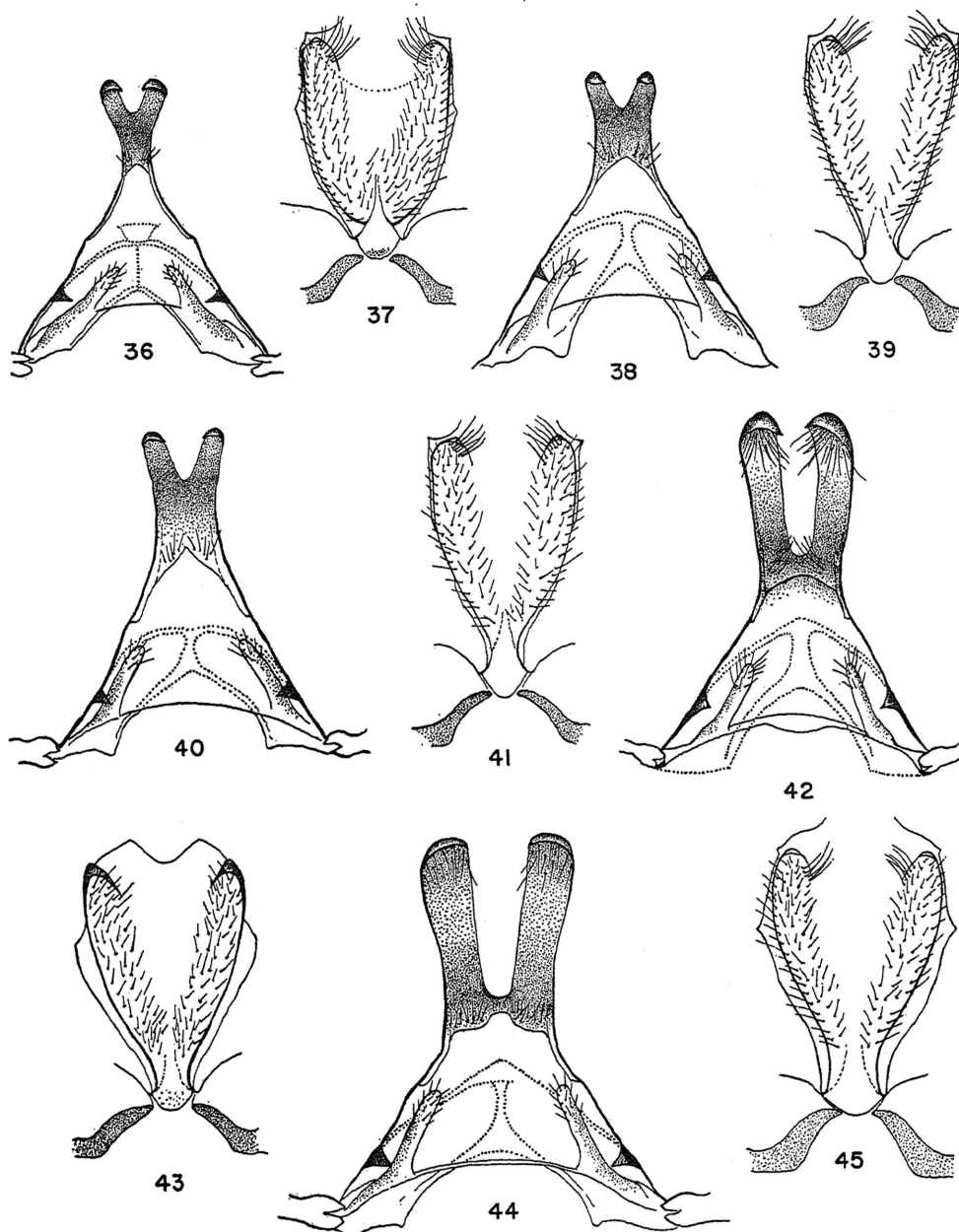
FIGS. 2-12. Male genitalia. 2. *Hydriomena tuolumne* Barnes and McDunnough, uncus and adjacent parts of holotype. 3. *H. tuolumne* Barnes and McDunnough, juxta plate of holotype. 4. *H. exculpata* Barnes and McDunnough, uncus and adjacent parts of holotype. 5. *H. exculpata* Barnes and McDunnough, uncus and adjacent parts of topotypical male, showing variant uncus. 6. *H. exculpata* Barnes and McDunnough, juxta plate of holotype. 7. *H. exculpata josepha* McDunnough, uncus and adjacent parts of holotype. 8. *H. exculpata josepha* McDunnough, juxta plate of holotype. 9. *H. expurgata* Barnes and McDunnough, uncus and adjacent parts of paratype. 10. *H. expurgata* Barnes and McDunnough, juxta plate of paratype. 11. *H. expurgata nicolensis* McDunnough, uncus and adjacent parts of holotype. 12. *H. expurgata nicolensis* McDunnough, juxta plate of holotype.



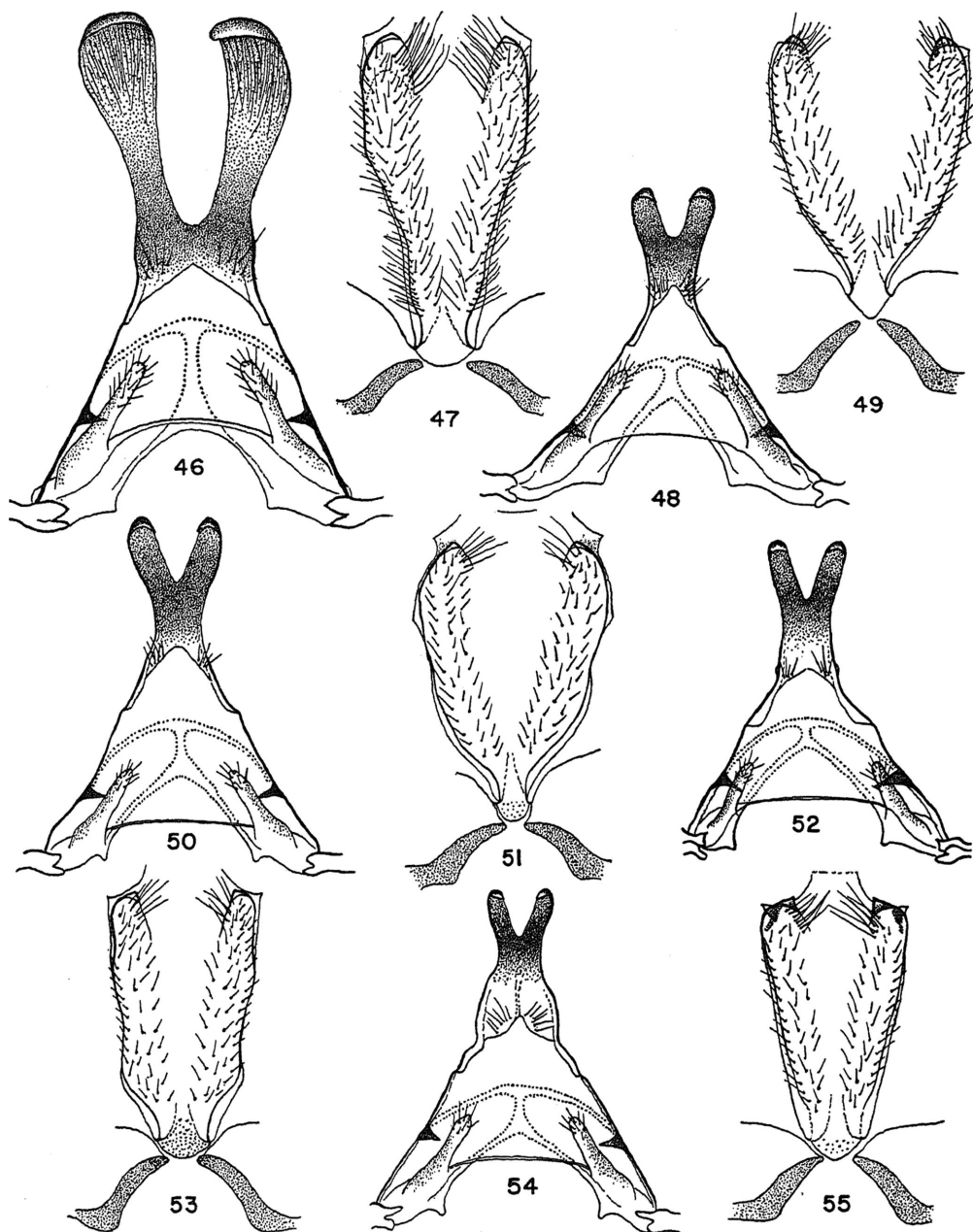
FIGS. 13-24. Male genitalia. 13. *Hydriomena shasta* Barnes and McDunnough, uncus and adjacent parts of holotype. 14. *H. shasta* Barnes and McDunnough, juxta plate of holotype. 15. *H. borussata* Barnes and McDunnough, uncus and adjacent parts of allotype. 16. *H. borussata* Barnes and McDunnough, juxta plate of allotype. 17. *H. irata* Swett, uncus and adjacent parts of topotypical specimen. 18. *H. irata* Swett, juxta plate of same specimen. 19. *H. irata quaesitata* Barnes and McDunnough, uncus and adjacent parts of holotype. 20. *H. irata quaesitata* Barnes and McDunnough, juxta plate of holotype. 21. *H. charlestonia* McDunnough, uncus and adjacent parts of holotype. 22. *H. charlestonia* McDunnough, juxta plate of holotype. 23. *H. marinata* Barnes and McDunnough, uncus and adjacent parts of holotype. 24. *H. marinata* Barnes and McDunnough, juxta plate of holotype.



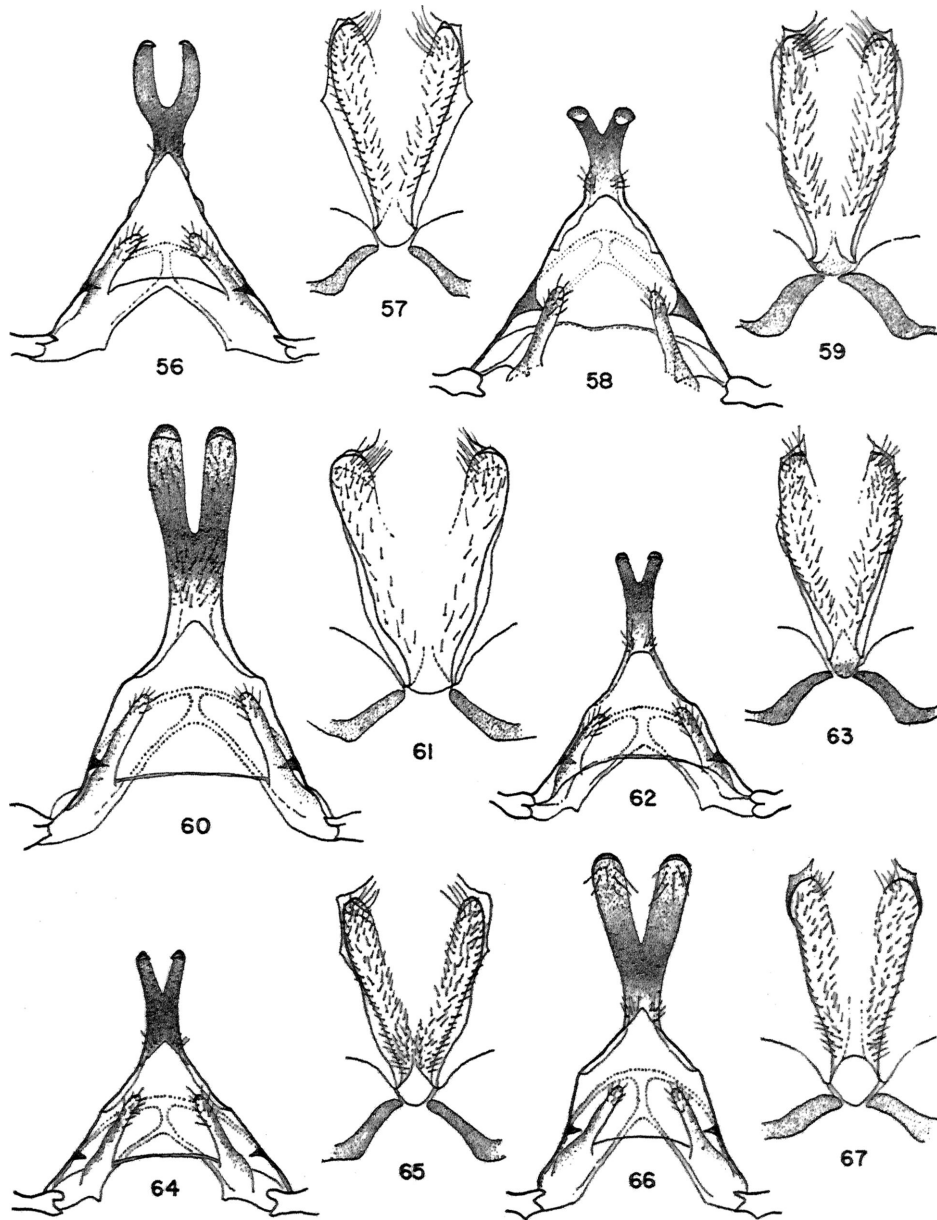
FIGS. 25-35. Male genitalia. 25. *Hydriomena marinata exasperata* Barnes and McDunnough, uncus and adjacent parts of holotype. 26. *H. marinata exasperata* Barnes and McDunnough, juxta plate of holotype. 27. *H. edenata* Swett, uncus and adjacent parts of specimen from Spring Mountain, Napa County, California. 28. *H. edenata* Swett, juxta plate of same specimen. 29. *H. edenata baueri* McDunnough, uncus and adjacent parts of variant specimen from Lake County, California. 30. *H. edenata baueri* McDunnough, juxta plate of same specimen. 31. *H. edenata indistincta* McDunnough, uncus and adjacent parts of paratype. 32. *H. edenata indistincta* McDunnough, juxta plate of paratype. 33. *H. furtivata* McDunnough, uncus and adjacent parts of topotypical specimen from White Mountains, Arizona. 34. *H. furtivata* McDunnough, juxta plate of same specimen. 35. *H. furtivata* McDunnough, uncus and adjacent parts of variant specimen from Little Colorado River, White Mountains, Arizona.



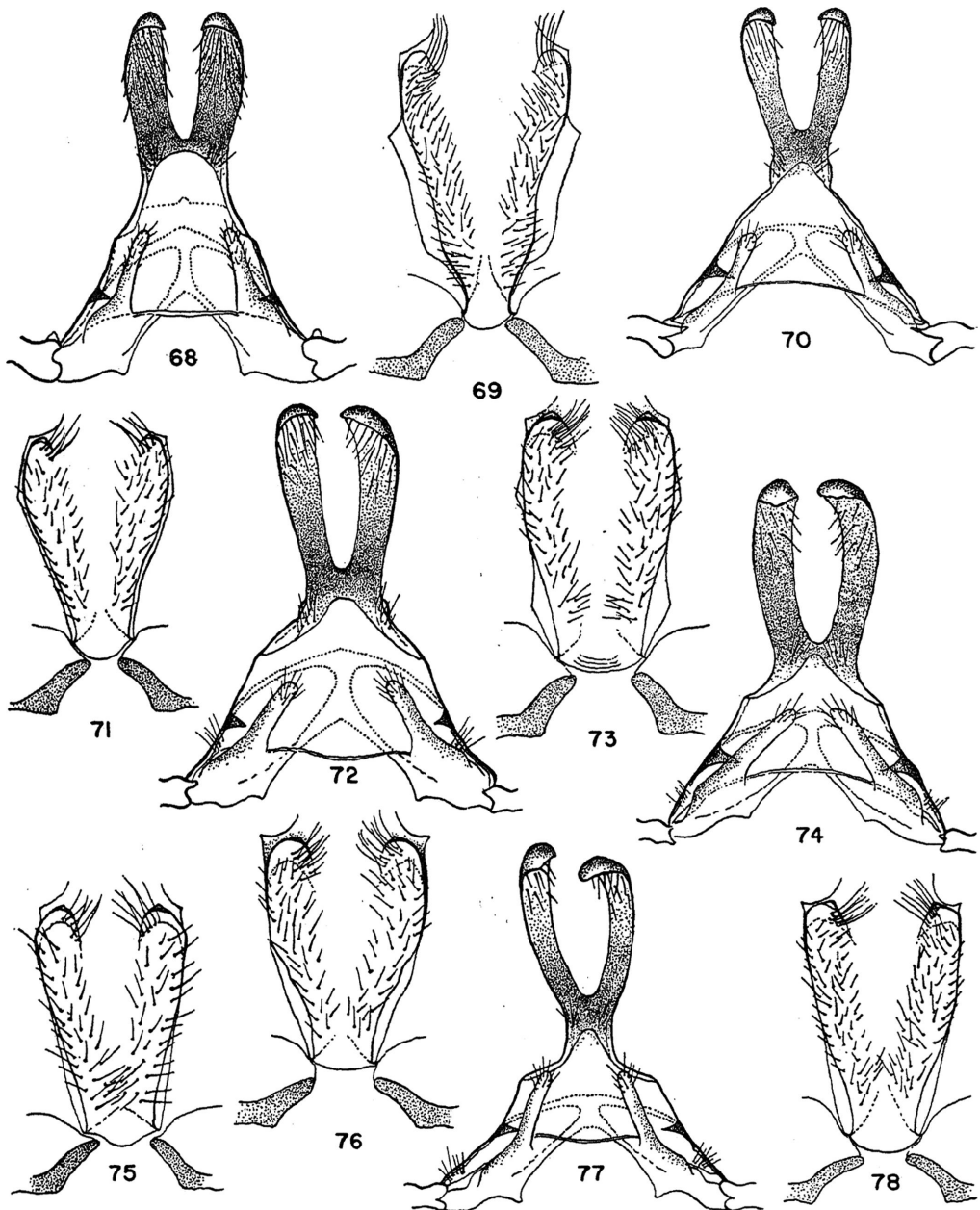
FIGS. 36-45. Male genitalia. 36. *Hydriomena johnstoni* McDunnough, uncus and adjacent parts of holotype. 37. *H. johnstoni* McDunnough, juxta plate of holotype. 38. *H. divisaria* Walker, uncus and adjacent parts of specimen from Kazabazua, Quebec. 39. *H. divisaria* Walker, juxta plate of same specimen. 40. *H. divisaria frigidata* Walker, uncus and adjacent parts of specimen from Mt. Uniacke, Nova Scotia. 41. *H. divisaria frigidata* Walker, juxta plate of same specimen. 42. *H. renunciata* Walker, uncus and adjacent parts of specimen from Armdale, Nova Scotia. 43. *H. renunciata* Walker, juxta plate of same specimen. 44. *H. renunciata viridescens* McDunnough, uncus and adjacent parts of holotype. 45. *H. renunciata viridescens* McDunnough, juxta plate of holotype.



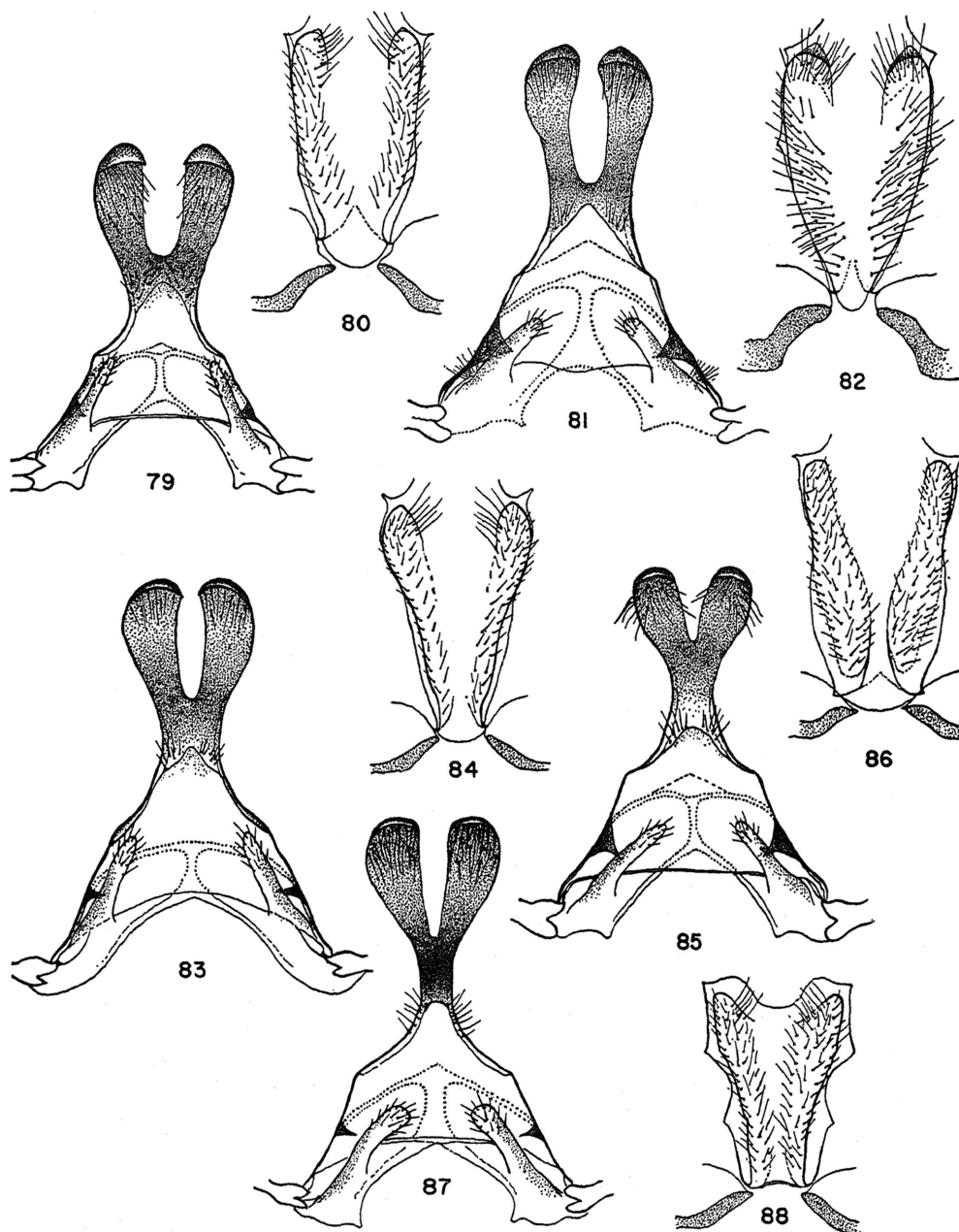
FIGS. 46-55. Male genitalia. 46. *Hydriomena bistriolata* Walker, uncus and adjacent parts of specimen from Atlanta, Georgia. 47. *H. bistriolata* Walker, juxta plate of same specimen. 48. *H. transfigurata* Swett, uncus and adjacent parts of specimen from Barnstable, Massachusetts. 49. *H. transfigurata* Swett, juxta plate of same specimen. 50. *H. transfigurata manitoba* Barnes and McDunnough, uncus and adjacent parts of specimen from Brandon, Manitoba. 51. *H. transfigurata manitoba* Barnes and McDunnough, juxta plate of same specimen. 52. *H. pluviosa meridianata* McDunnough, uncus and adjacent parts of topotypical specimen. 53. *H. pluviosa meridianata* McDunnough, juxta plate of same specimen. 54. *H. obliquilinea* Barnes and McDunnough, uncus and adjacent parts of allotype. 55. *H. obliquilinea* Barnes and McDunnough, juxta plate of allotype.



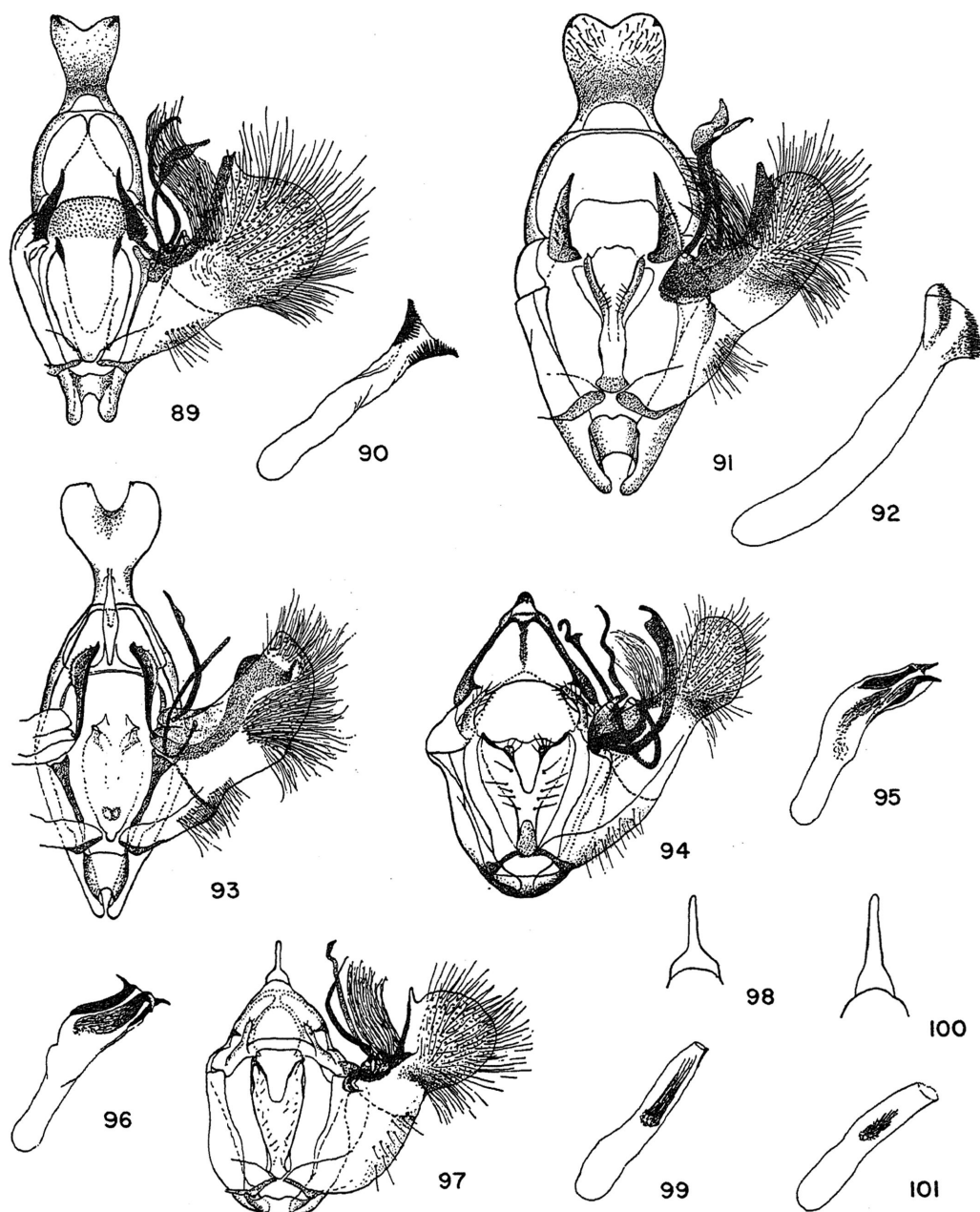
FIGS. 56-67. Male genitalia. 56. *Hydriomena rita* McDunnough, uncus and adjacent parts of holotype. 57. *H. rita* McDunnough, juxta plate of holotype. 58. *H. arizonata* Barnes and McDunnough, uncus and adjacent parts of holotype. 59. *H. arizonata* Barnes and McDunnough, juxta plate of holotype. 60. *H. albimontanata* McDunnough, uncus and adjacent parts of topotypical specimen. 61. *H. albimontanata* McDunnough, juxta plate of same specimen. 62. *H. sierrae* Barnes and McDunnough, uncus and adjacent parts of holotype. 63. *H. sierrae* Barnes and McDunnough, juxta plate of holotype. 64. *H. sierrae* Barnes and McDunnough, uncus and adjacent parts of variant specimen from Gold Lake, Sierra County, California. 65. *H. sierrae* Barnes and McDunnough, juxta plate of same specimen. 66. *H. nevadae* Barnes and McDunnough, uncus and adjacent parts of specimen from Mohawk, Plumas County, California. 67. *H. nevadae* Barnes and McDunnough, juxta plate of same specimen.



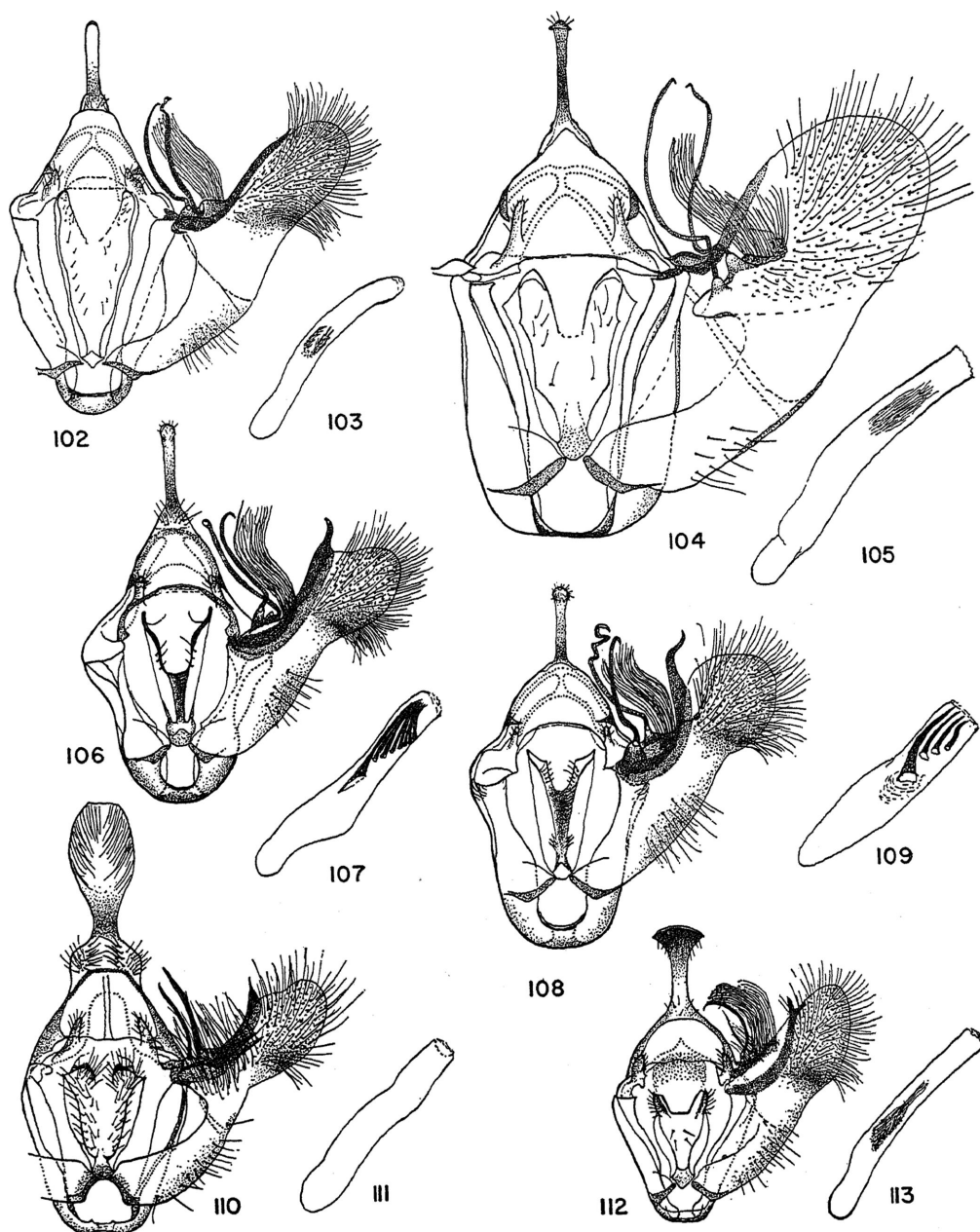
FIGS. 68-78. Male genitalia. 68. *Hydriomena californiata* Packard, uncus and adjacent parts of specimen from Marin County, California. 69. *H. californiata* Packard, juxta plate of same specimen. 70. *H. crokeri* Swett, uncus and adjacent parts of topotypical specimen. 71. *H. crokeri* Swett, juxta plate of same specimen. 72. *H. crokeri comstocki* McDunnough, uncus and adjacent parts of holotype. 73. *H. crokeri comstocki* McDunnough, juxta plate of holotype. 74. *H. glaucata* Packard, uncus and adjacent parts of specimen from Santa Catalina Island, California. 75. *H. glaucata* Packard, juxta plate of same specimen. 76. *H. glaucata* Packard, juxta plate of variant specimen from same locality. 77. *H. muscata* Barnes and McDunnough, uncus and adjacent parts of specimen matching holotype from Petaluma, Sonoma County, California. 78. *H. muscata* Barnes and McDunnough, juxta plate of same specimen.



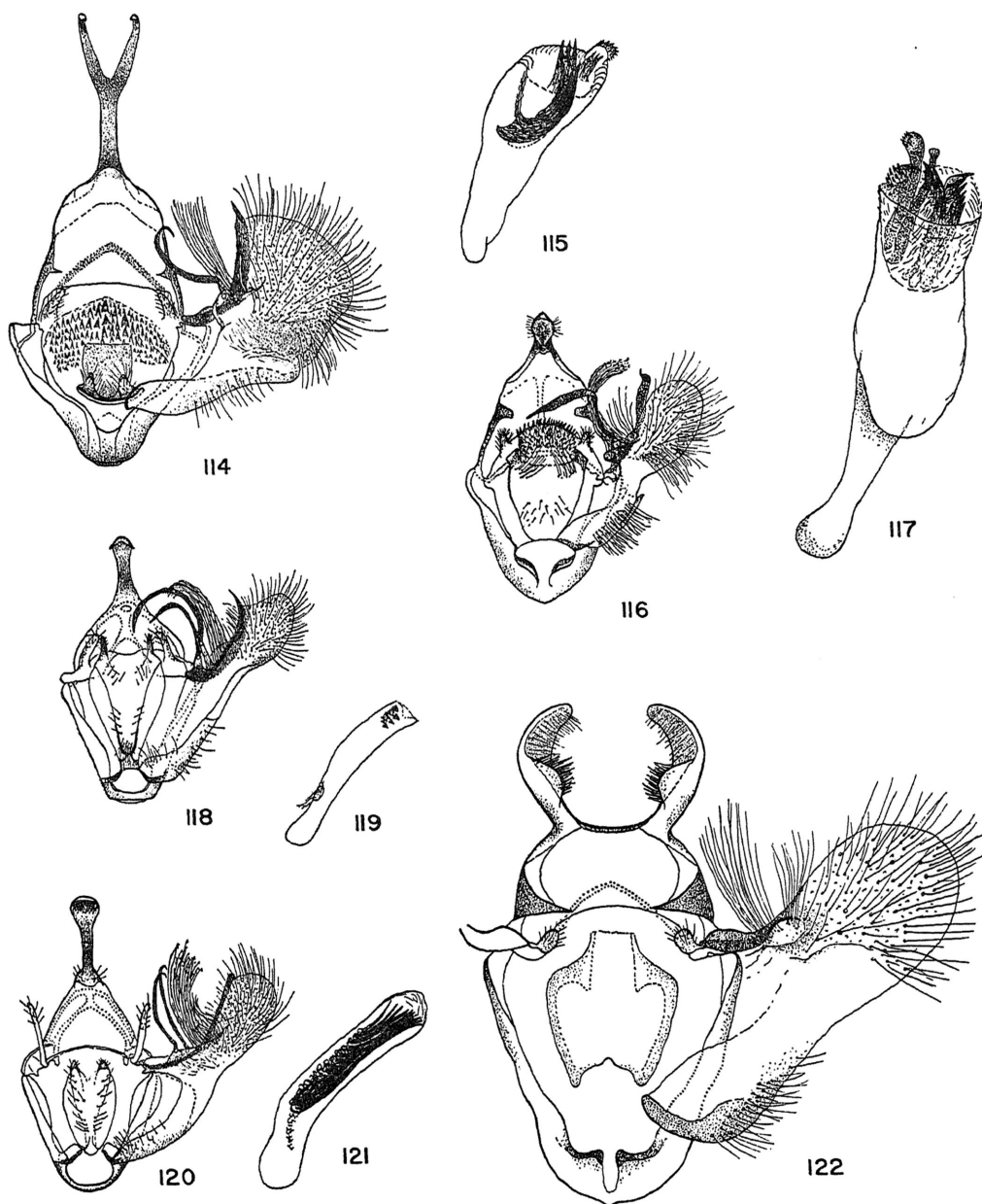
FIGS. 79-88. Male genitalia. 79. *Hydryomena chiricahuata* Swett, uncus and adjacent parts of specimen from Santa Rita Mountains, Arizona. 80. *H. chiricahuata* Swett, juxta plate of same specimen. 81. *H. modestata* Barnes and McDunnough, uncus and adjacent parts of allotype. 82. *H. modestata* Barnes and McDunnough, juxta plate of allotype. 83. *H. feminata* McDunnough, uncus and adjacent parts of topotypical specimen from Marin County, California. 84. *H. feminata* McDunnough, juxta plate of same specimen. 85. *H. ruberata* Freyer, uncus and adjacent parts of specimen from Kings County, Nova Scotia. 86. *H. ruberata* Freyer, juxta plate of same specimen. 87. *H. macdunnoughi* Swett, uncus and adjacent parts of specimen from Nordegg, Alberta. 88. *H. macdunnoughi* Swett, juxta plate of same specimen.



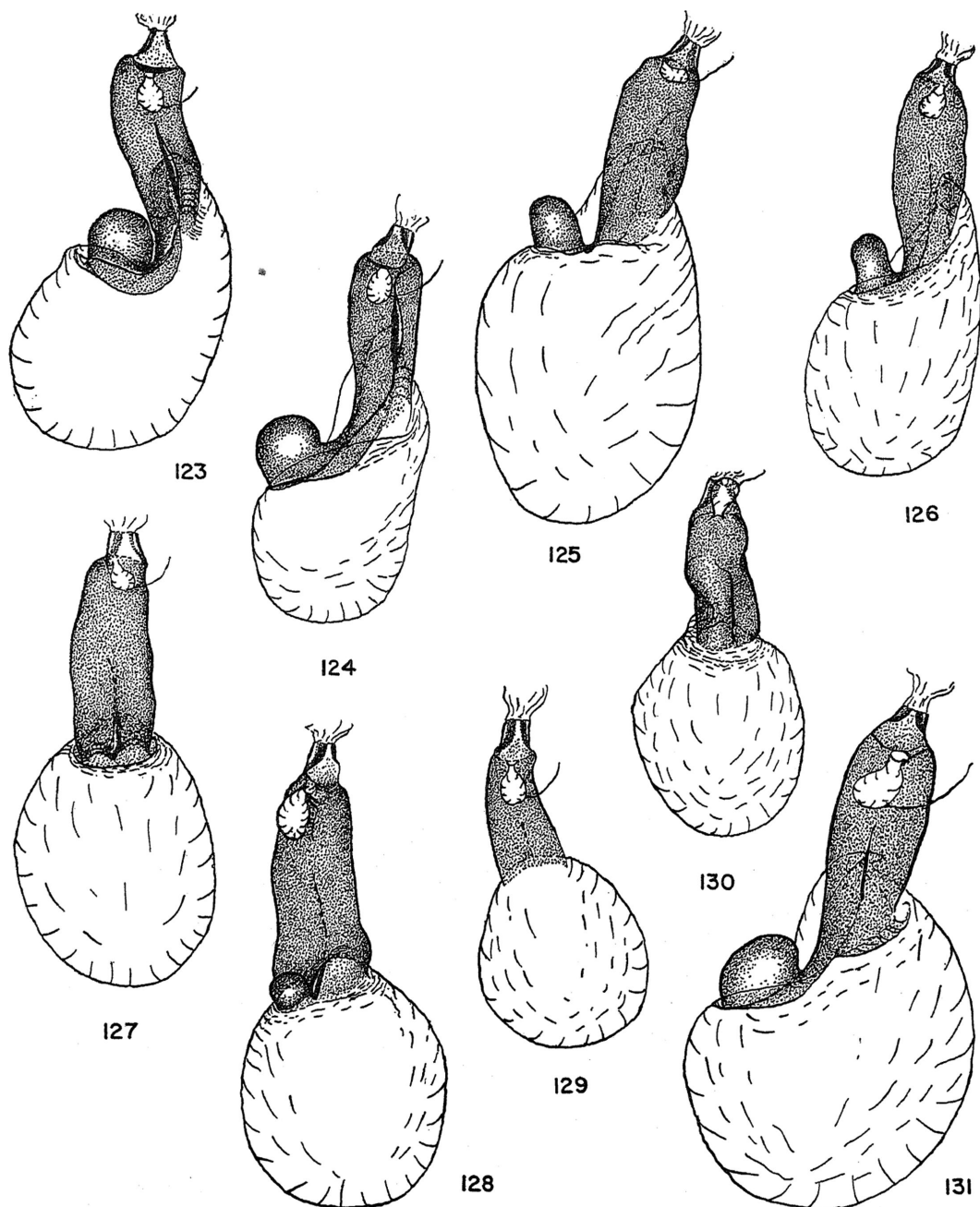
FIGS. 89-101. Male genitalia. 89. *Hydriomena furcata* Borgström, specimen from Wallace, Idaho. 90. *H. furcata* Borgström, aedeagus of same specimen. 91. *H. catalinata* McDunnough, holotype. 92. *H. catalinata* McDunnough, aedeagus of holotype. 93. *H. costipunctata* Barnes and McDunnough, allotype. 94. *H. albifasciata* Packard, specimen from Mendocino County, California. 95. *H. albifasciata* Packard, aedeagus of same specimen. 96. *H. cochiseata* Swett, aedeagus of specimen from Palmerlee, Arizona. 97. *H. speciosata* Packard, specimen from Victoria, British Columbia. 98. *H. speciosata* Packard, uncus of same specimen. 99. *H. speciosata* Packard, aedeagus of same specimen, enlarged. 100. *H. morosata* Barnes and McDunnough, uncus of specimen from White Mountains, Arizona, enlarged. 101. *H. morosata* Barnes and McDunnough, aedeagus of same specimen.



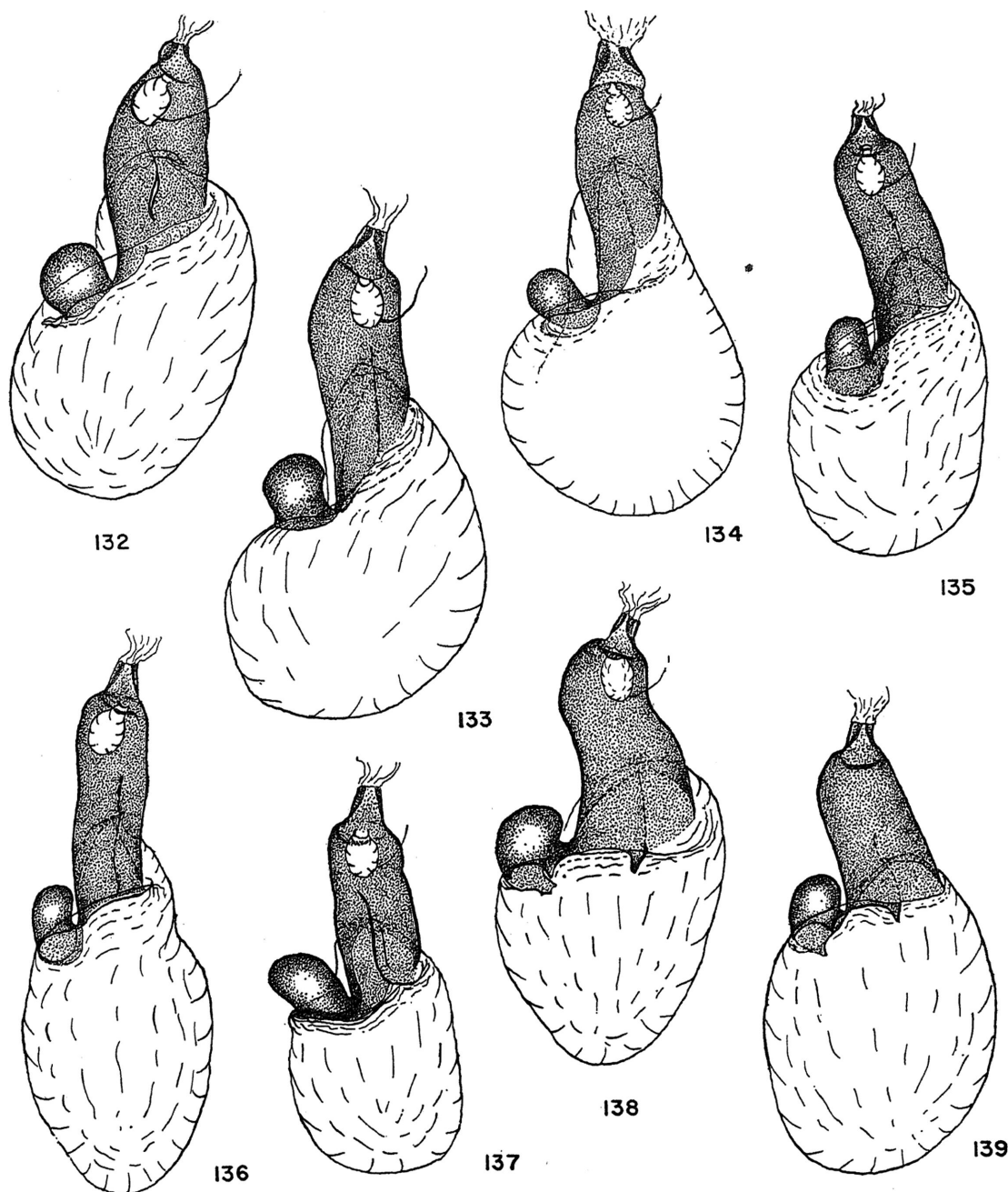
FIGS. 102-113. Male genitalia. 102. *Hydriomena barnesata* Swett, specimen from Oak Creek Canyon, Arizona. 103. *H. barnesata* Swett, aedeagus of same specimen. 104. *H. cyriadoides* McDunnough, holotype. 105. *H. cyriadoides* McDunnough, aedeagus of holotype. 106. *H. bryanti* McDunnough, topotypical specimen. 107. *H. bryanti* McDunnough, aedeagus of same specimen. 108. *H. clarki* Wright, specimen from Santa Catalina Mountains, Arizona. 109. *H. clarki* Wright, aedeagus of same specimen. 110. *H. magnificata* Taylor, specimen from Huachuca Mountains, Arizona. 111. *H. magnificata* Taylor, aedeagus of same specimen. 112. *H. gracillima* McDunnough, paratype. 113. *H. gracillima* McDunnough, aedeagus of paratype.



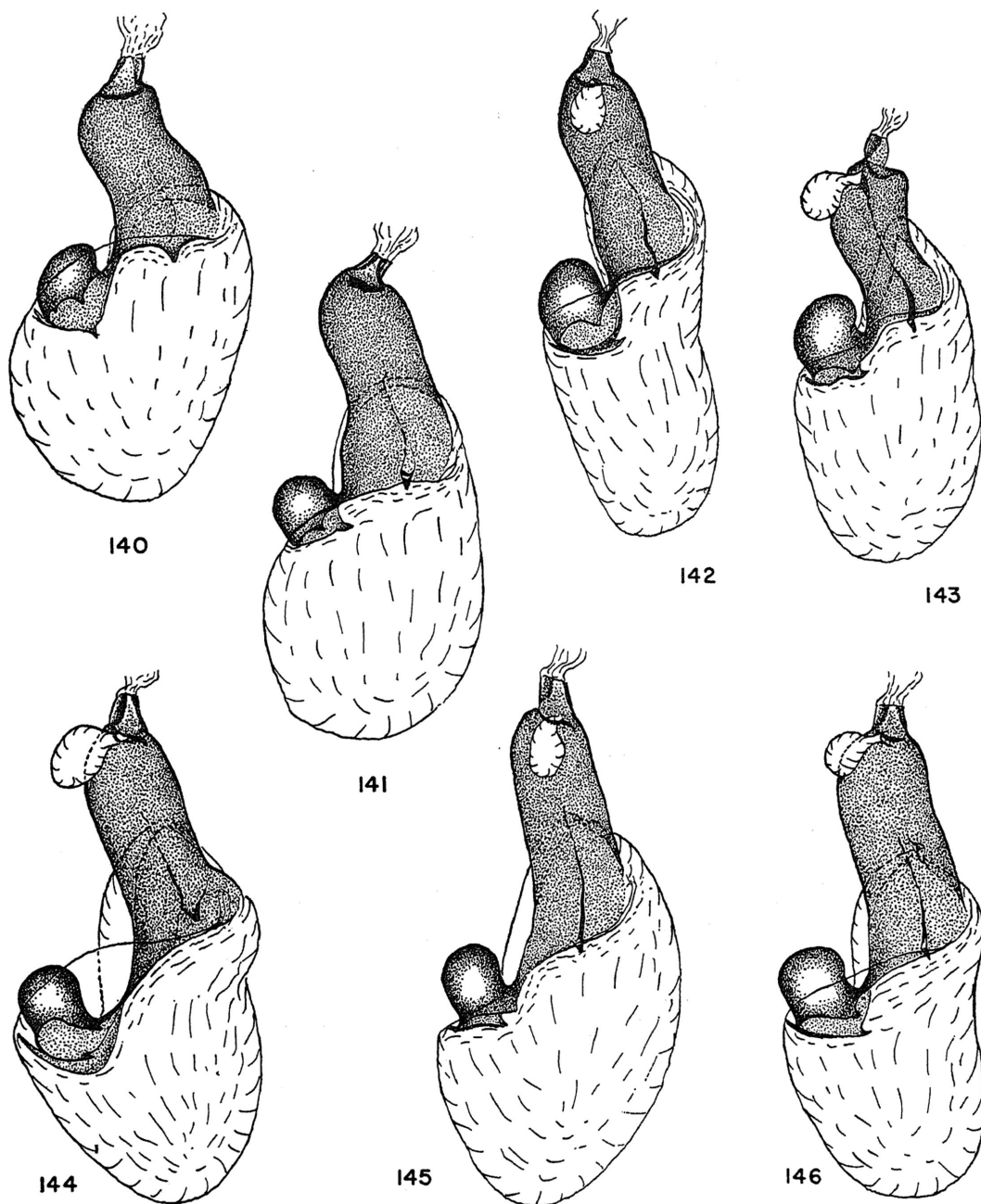
FIGS. 114-122. Male genitalia. 114. *Hydriomena furculoides* Barnes and McDunnough, specimen from Alpine, White Mountains, Arizona. 115. *H. furculoides* Barnes and McDunnough, aedeagus of same specimen. 116. *H. similis* Hulst, specimen from Oak Creek Canyon, Arizona. 117. *H. similis* Hulst, aedeagus of same specimen, enlarged. 118. *H. nubilofasciata* Packard, specimen from Napa County, California. 119. *H. nubilofasciata* Packard, aedeagus of same specimen. 120. *H. manzanita* Taylor, topotypical specimen. 121. *H. manzanita* Taylor, aedeagus of same specimen. 122. *Hymenodromia mediodentata* Barnes and McDunnough, specimen from Palmerlee, Arizona.



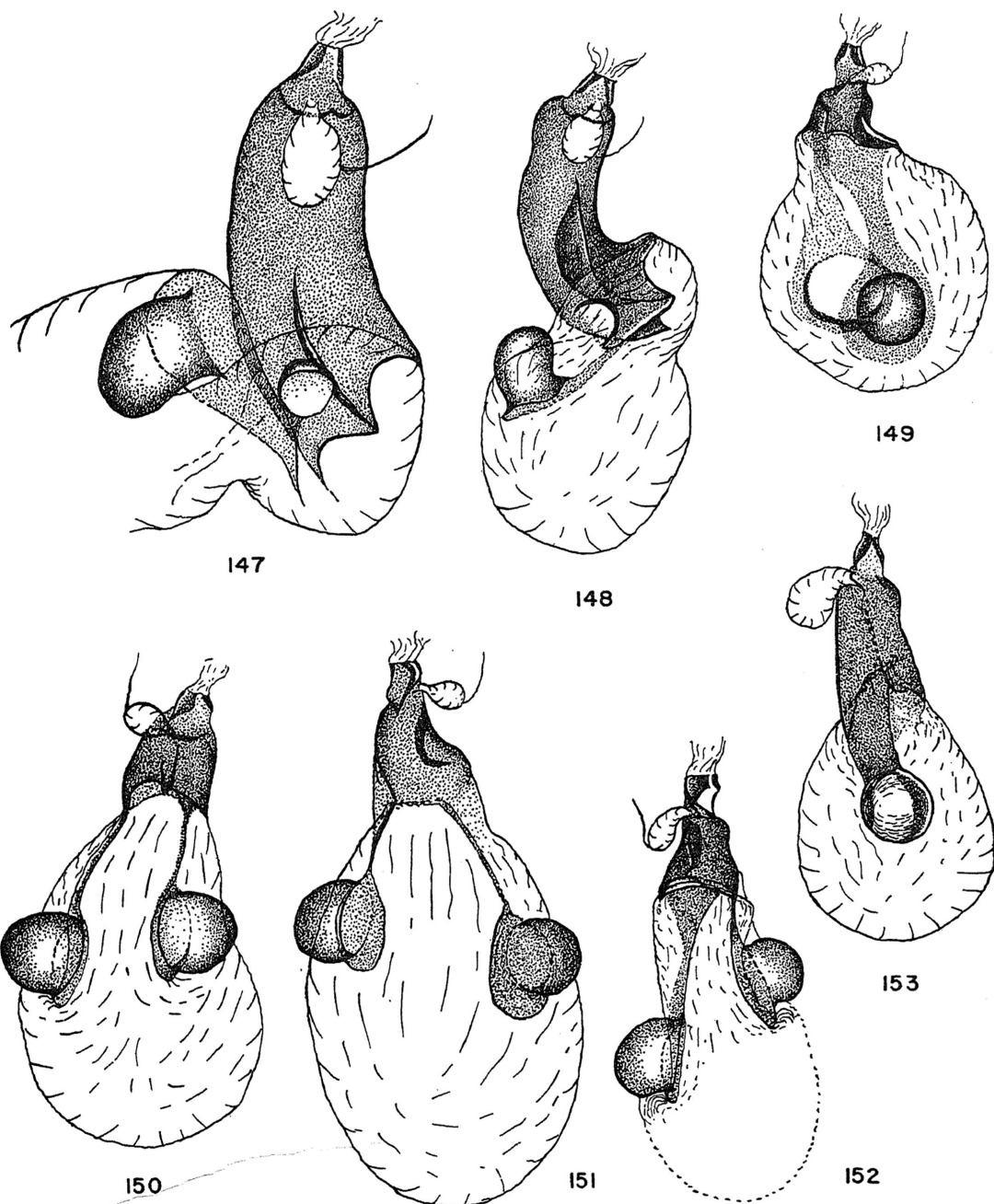
FIGS. 123-131. Female genitalia. 123. *Hydriomena tuolumne* Barnes and McDunnough, paratype. 124. *H. exculpata* Barnes and McDunnough, allotype. 125. *H. expurgata* Barnes and McDunnough, holotype. 126. *H. expurgata alticola* McDunnough. 127. *H. borussata* Barnes and McDunnough, holotype. 128. *H. borussata* Barnes and McDunnough, aberrant specimen from Mt. Shasta, California. 129. *H. irata* Swett, topotypical specimen. 130. *H. irata quaesitata* Barnes and McDunnough, specimen from upper Santa Ana River, San Bernardino County, California. 131. *H. perfracta* Swett, specimen from Lequille, Annapolis County; Nova Scotia.



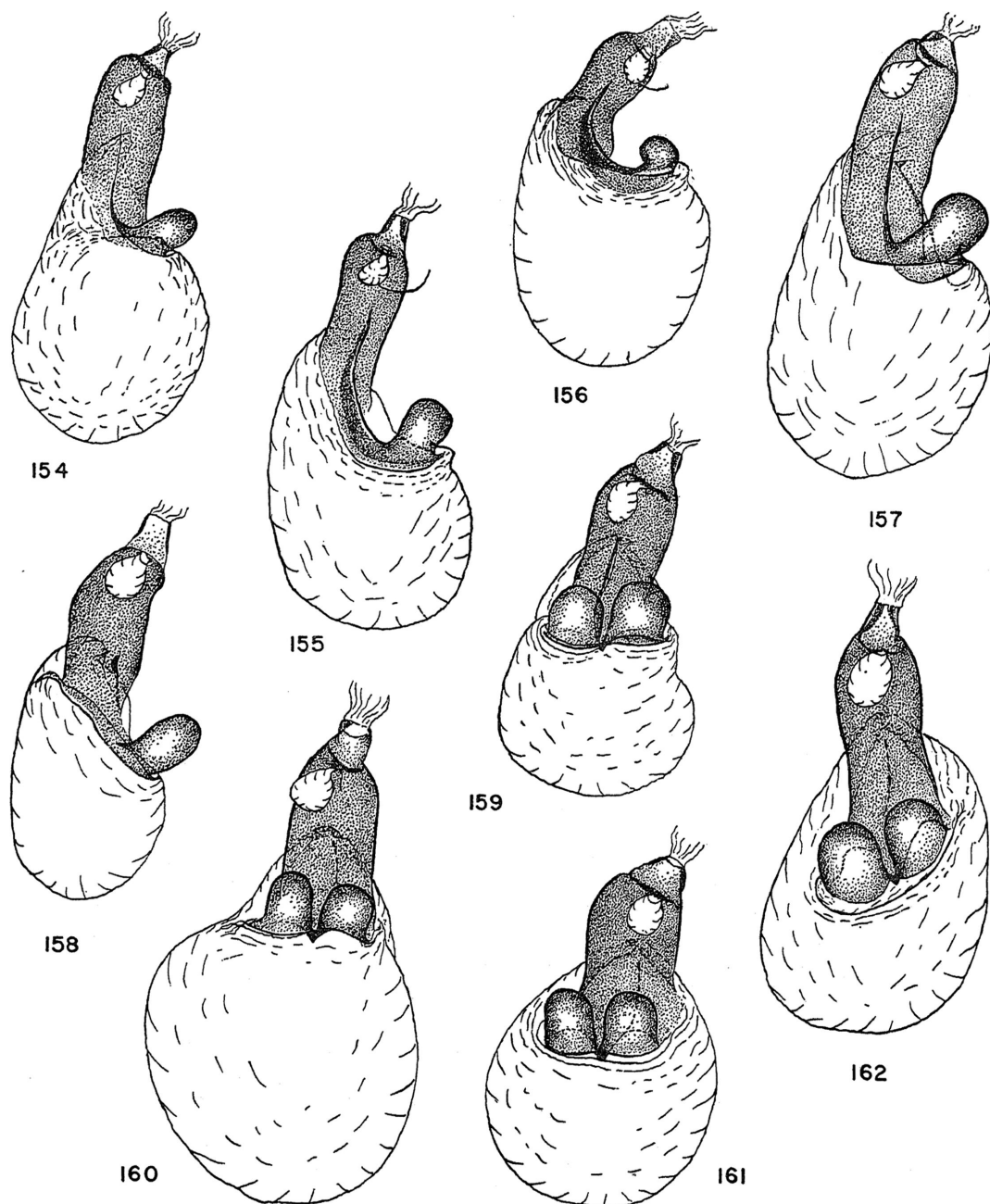
FIGS. 132-139. Female genitalia. 132. *Hydriomena perfracta* Swett, variant specimen from Baddeck, Nova Scotia. 133. *H. perfracta marmorata* Barnes and McDunnough, holotype. 134. *H. marinata* Barnes and McDunnough, specimen from Crescent City, Del Norte County, California. 135. *H. edenata* Swett, paratype. 136. *H. edenata indistincta* McDunnough, paratype. 137. *H. furtivata* McDunnough, specimen from Little Colorado River, Arizona. 138. *H. divisaria* Walker, variant specimen from Oscoda County, Michigan. 139. *H. divisaria frigidata* Walker, variant specimen from Mt. Uniacke, Nova Scotia.



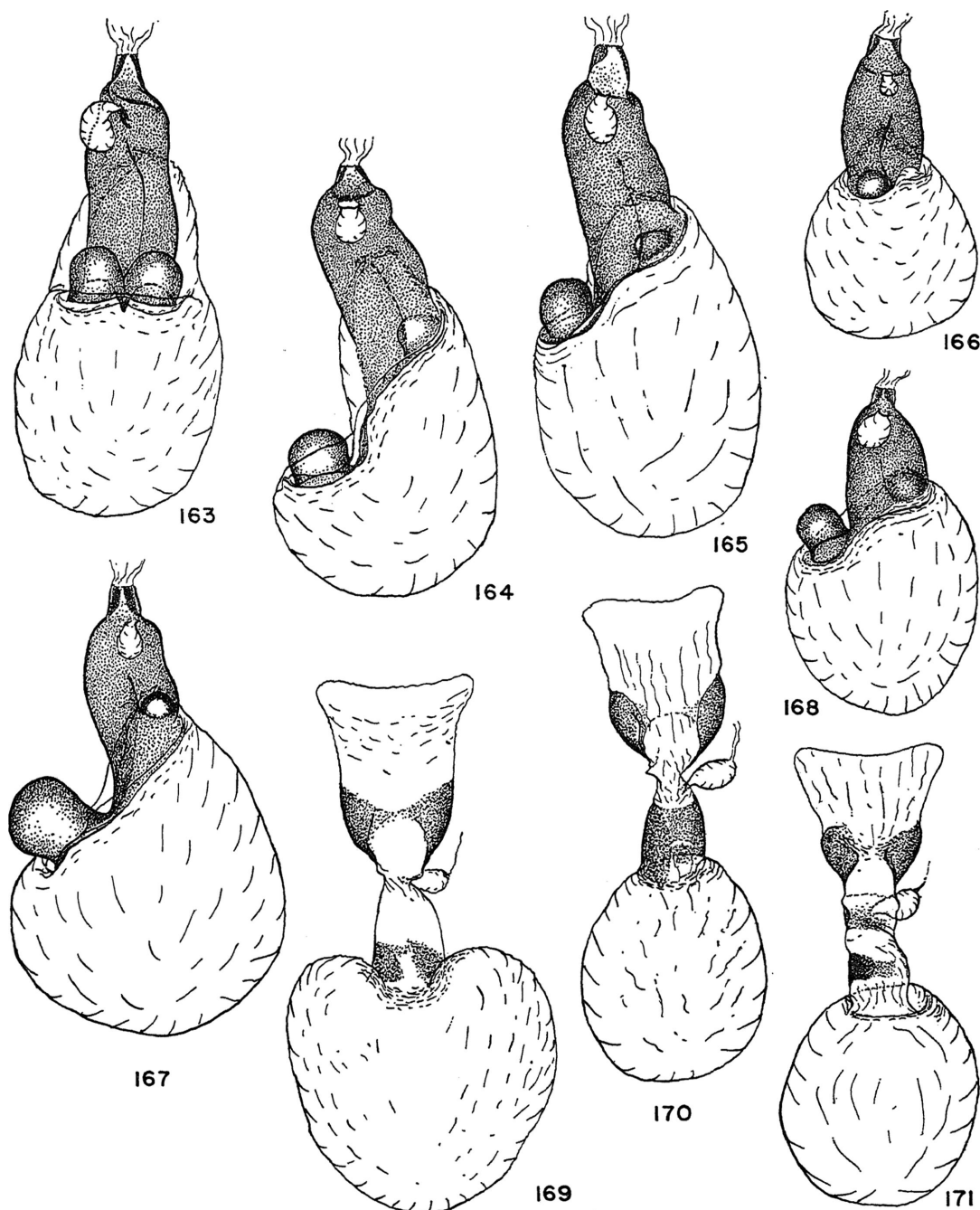
FIGS. 140-146. Female genitalia. 140. *Hydriomena divisaria frigidata* Walker, variant specimen from Mt. Uniacke, Nova Scotia. 141. *H. divisaria frigidata* Walker, variant specimen from Mt. Uniacke, Nova Scotia. 142. *H. renunciata* Walker, specimen from Baddeck, Nova Scotia. 143. *H. renunciata* Walker, variant specimen from Armdale, Nova Scotia. 144. *H. renunciata columbiata* Taylor, topotypical specimen. 145. *H. renunciata viridescens* McDunnough, paratype. 146. *H. renunciata pernigrata* Barnes and McDunnough, specimen from Plumas County, California.



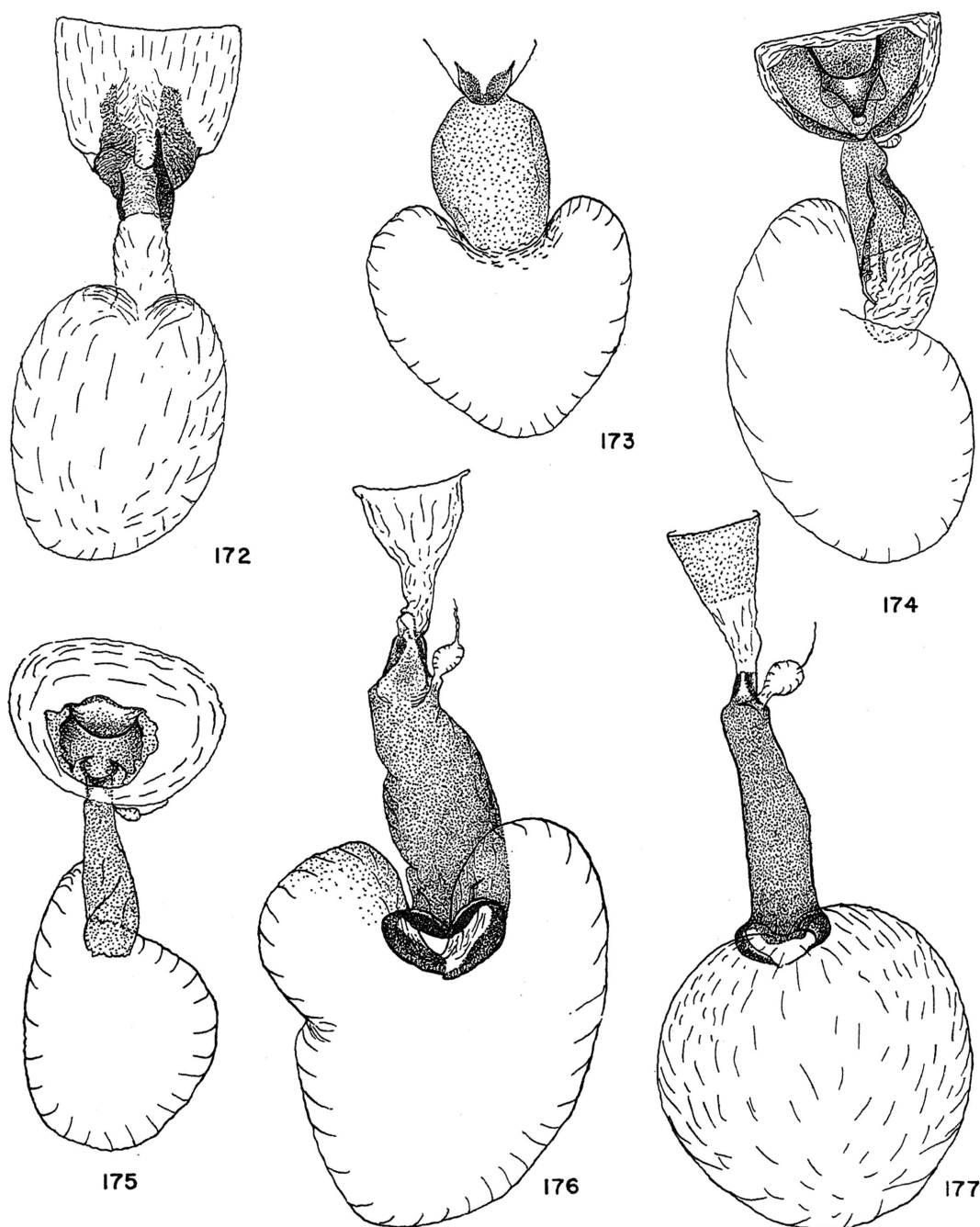
FIGS. 147-153. Female genitalia. 147. *Hydriomena bistriolata* Walker, holotype. 148. *H. transfigurata* Swett, specimen from Barnstable, Massachusetts. 149. *H. pluviata* Guenée, specimen from Barnstable, Massachusetts, ventral view. 150. *H. pluviata* Guenée, specimen from Lakehurst, New Jersey, lateral view. 151. *H. pluviata meridiana* McDunnough, allotype, lateral view. 152. *H. obliquilinea* Barnes and McDunnough, holotype, lateral view. 153. *H. albimontanata* McDunnough, topotypical specimen.



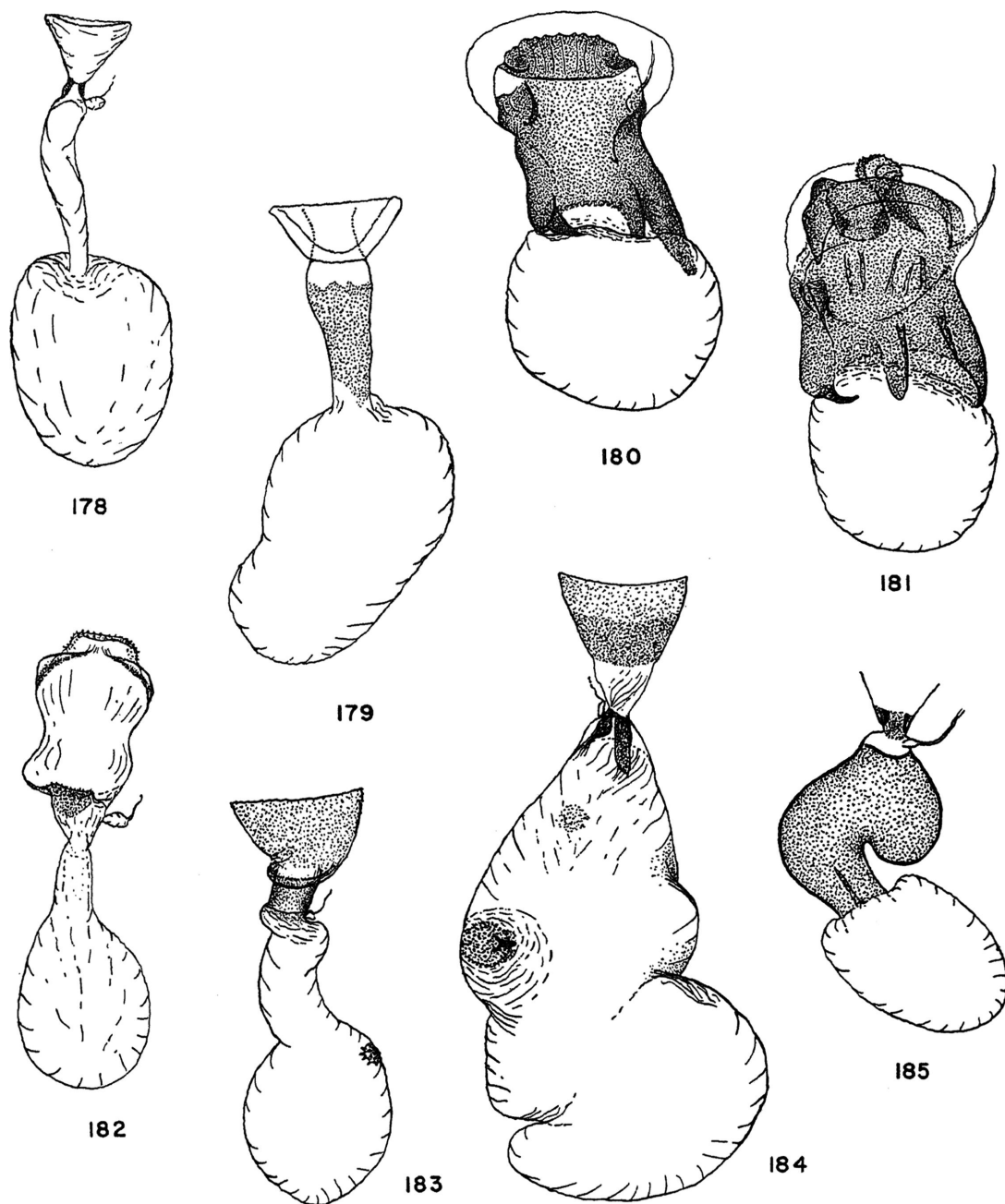
FIGS. 154-162. Female genitalia. 154. *Hydriomena sierrae* Barnes and McDunnough, allotype. 155. *H. sierrae* Barnes and McDunnough, specimen from Gold Lake, Sierra County, California. 156. *H. sierrae* Barnes and McDunnough, variant specimen of paratype from Cisco, Placer County, California. 157. *H. nevadae* Barnes and McDunnough, specimen from Greenhorn Mountains, California. 158. *H. californiata* Packard, specimen from Marin County, California. 159. *H. crokeri* Swett, topotypical specimen. 160. *H. crokeri comstocki* form *waltoni* McDunnough, allotype. 161. *H. crokeri comstocki* form *waltoni* McDunnough, variant specimen from Lake Tahoe, California. 162. *H. crokeri comstocki* McDunnough, variant specimen from upper Santa Ana River, San Bernardino Mountains, California.



FIGS. 163-171. Female genitalia. 163. *Hydriomena glaucata* Packard, specimen from Santa Catalina Island, California. 164. *H. chiricahuata* Swett, specimen from Santa Rita Mountains, Arizona. 165. *H. modestata* Barnes and McDonnough, holotype. 166. *H. feminata* McDunnough, topotypical specimen from Marin County, California. 167. *H. ruberata* Freyer, specimen from Centreville, Nova Scotia. 168. *H. macdunnoughi* Swett, allotype. 169. *H. furcata* Borgström, specimen from Wellington, British Columbia. 170. *H. furcata* Borgström, specimen from Baker, Oregon, poorly inflated. 171. *H. quinquefasciata* Packard, specimen from Humboldt County, California.



FIGS. 172-177. Female genitalia. 172. *Hydriomena catalinata* McDunnough, allotype. 173. *H. costipunctata* Barnes and McDunnough, holotype. 174. *H. albifasciata* Packard, specimen from Napa County, California. 175. *H. cochiseata* Swett, specimen from Palmerlee, Arizona. 176. *H. speciosata* Packard, specimen from Olympic Mountains, Washington. 177. *H. barnesata* Swett, specimen from Fort Wingate, New Mexico.



FIGS. 178-185. Female genitalia. 178. *Hydriomena cyriadoides* McDunnough, allotype. 179. *H. bryanti* McDunnough, specimen from Graham Mountains, Arizona. 180. *H. regulata* Pearsall, holotype. 181. *H. furculoides* Barnes and McDunnough, allotype. 182. *H. similaris* Hulst, specimen from Oak Creek Canyon, Arizona. 183. *H. nubilofasciata* Packard, specimen from Atascadero, California. 184. *H. manzanita* Taylor, specimen from Napa County, California. 185. *Hymenodria mediodentata* Barnes and McDunnough, holotype.